The Monthly Review

Published by the AMERICAN ELECTROPLATERS' SOCIETY

APRIL 1939

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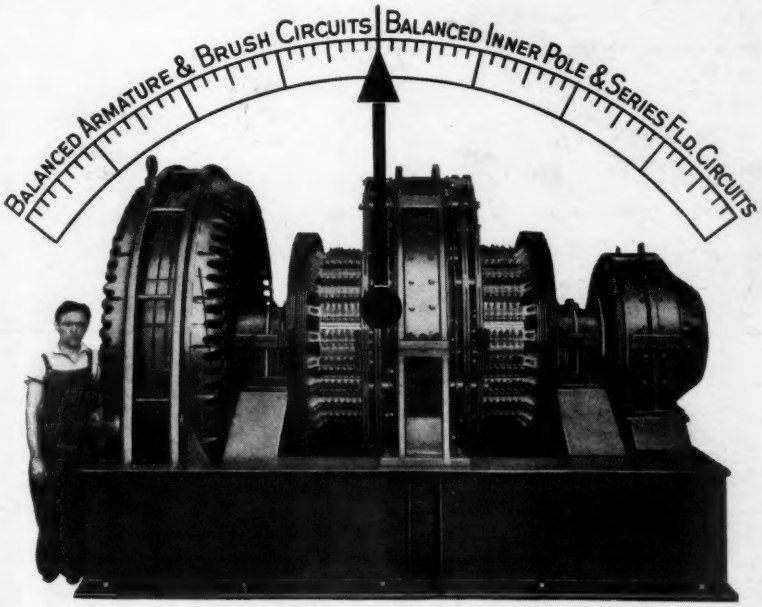

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The Monthly Review

Published by the
AMERICAN ELECTROPLATERS' SOCIETY, INC.

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The Plated-Ware Exhibit

Never in the history of the American Electroplaters' Society, have all the branches of the Society been represented with a display of plated-ware exhibits at any one convention. For the 1939 International Convention that is to be staged in Asbury Park, N. J., June 19, 20, 21, 22, Newark Branch as the hosts, extend their desires that they wish to go on record to be the first branch to achieve such an accomplishment.

Will you support Newark Branch in its efforts?

Newark Branch is endeavoring to support its boast (1) by paying the express charges on the articles that are to be exhibited, to Asbury Park and back to the address of the exhibitor. (2) In addition Newark Branch will also have the articles insured for theft, etc., while on display during the four days of the convention.

If you have not expressed your intentions to your branch chairman concerning a display of plated-ware, why not do it now! Take advantage of the saving and the security offered. Join the cavalcade of exhibitors to the International Convention. The plated-ware exhibit will not only include work of the artisan but also work taken from the automatic mass production lines, such as automotive and refrigerator, furniture, plumbing and builders' hardware, jewelry, optical goods, lighting fixtures, radio and camera parts and many other metal novelties, etc. Anything that constitutes your daily production will be appropriate and welcome as an exhibit.

Reports coming in from the following branches indicate that the plated-ware exhibit will be an outstanding event:

Anderson	Cleveland	New Haven
Baltimore-Washington	Dayton	New York
Boston	Detroit	Pittsburgh
Bridgeport	Grand Rapids	Rochester
Buffalo	Hartford	Springfield
Cincinnati	Milwaukee	Waterbury
San Francisco	Los Angeles	Philadelphia

Has your branch appointed a chairman who will solicit plated-ware in your branch?

Instructive suggestions:

(1) Articles to be displayed should be mounted on 4 x 3 foot size panel boards, covered with black cloth. The 3 foot ends are to be top and bottom.

(2) Any amount of panel board displays will be accepted, either as individual or group combinations.

(3) Name of electro-plater, branch and firm connection should be attached on the display board.

(4) Wherever possible parts should be securely fastened to the display board.

(5) Articles are to be numbered in rotation on the board, for identification in the contemplated reference book.

(6) Reference sheet: Formulas and the sequence of operations concerning the finished article should be typewritten on standard size 8½ x 11 inch paper, allowing 1½ inch margin on the left hand side.

Example: Articles numbered 10 on your display board will be paged in the loose leaf reference book containing all the other exhibitors data, when found under your branch heading it should read thus:

Article — 10.

Name of the article — Hub Cap.

Base Metal — Cold Rolled Steel.

No. 1 Plating — Nickle; give formula and operating conditions, C/D temp., etc.

Polishing — ?

No. 2 Plating — Chromium; give formula and operating conditions, C/D temp., etc.

Any other information in regard to the finish, included on the reference sheet will be appreciated.

Shipping instructions will be published in the May issue of the MONTHLY REVIEW.

THE PLATED-WARE EXHIBIT COMMITTEE.

Paul A. Oldam, *Chairman,*
90 Montgomery Ave.,
Newark, New Jersey.

WE SHALL MEET AGAIN

AT

"27th Annual Convention"

AMERICAN ELECTROPLATERS' SOCIETY

AND THE

SECOND INTERNATIONAL CONVENTION

100TH ANNIVERSARY OF PLATING

BERKELEY-CARTERET HOTEL

ASBURY PARK, N. J.

JUNE 19-20-21-22 1939

! Old Friends Getting Together to Discuss New Ideas !

More than a score of vitally important prepared papers by experienced men are to be presented, not only prepared in the United States, but in Canada, England and France. Discussions on outstanding developments of the year. There will be time to discuss ideas informally as well as play golf, ocean fishing, swim, or attend the World's Fair.

This is to be a meeting not to be forgotten, a Convention you should attend. Be sure to come and bring with you as many of your associates as possible. (Can you bring the Family?) Of course, the children too, a little vacation on the Jersey coast is a lovely spot in June. Scenic Tours, ocean sailing, bay sailing and Railroad Excursions to many points of interest. New Jersey offers numerous other inducements to attend this meeting. It is not too early to make your reservations now.

DON'T MISS IT

Write

NEWARK BRANCH A.E.S. HOTEL DOUGLAS, NEWARK, N.J.

"EDUCATIONAL PROGRAM FOR 1939 CONVENTION"

Arranged by Educational Committee, George B. Hogaboom, Chairman

Sessions start promptly on time!

FIRST SESSION — MONDAY AFTERNOON JUNE 19TH — 1:30 P.M.

CHARLES H. PROCTOR, Presiding
Founder, American Electroplaters' Society

1. "Notes on Adhesion of Electroplated Coatings." *A. W. Hothersall*, M.Sc., Woolwich, London, England.
2. "Distribution of Deposits on Cup Shaped Cathodes." *G. F. Gardam*, B.Sc., A.R.C.Sc.
3. "Recent Developments in British Plating Practice." *C. F. Francis-Clark*, Ch.E.
4. "Chemical Methods for Testing Thickness of Metallic Coating." *S. G. Clark*, Ph.D.
   The above papers are contributions from The Electro Depositors Technical Society, London, England.
5. "Review of Electro Plating Methods in France." *M. Ballay*, Ph.D., Consulting Engineer, Paris, France.

SECOND SESSION — TUESDAY MORNING, JUNE 20TH — 9:00 A.M.

JOHN ACHESON, Presiding
President, Toronto Branch

1. "The Role of Diffusion in Electroplating Process." *Dr. J. T. Burt-Gerraus*, Toronto University, Toronto, Can.
2. "Theoretical Training for Electroplating Industry." *Dr. J. U. MacEwan Birks*, Professor of Metallurgy, McGill University, Montreal, Canada.
3. "Electrodeposition of Black Molybdenum Finishes." *R. O. Hull*, Cleveland Branch, The Grasselli Chemical Co., Cleveland, Ohio.
4. "The Ampere Hour Meter." *Burton G. Daw*, St. Louis Branch President, Lasalco, Inc., St. Louis, Mo.

THIRD SESSION — TUESDAY AFTERNOON, JUNE 20TH — 1:30 P.M.

CHARLES C. CONLEY, Presiding
President, Dayton Branch

1. "Chromium Plating Dies and Gauges." *Dr. D. A. Cotton*, Anderson Branch· Director Research, Delco Remy Division, General Motors Corp., Anderson, Indianna.
2. "Anodic Coatings of Aluminum." *Dr. Junius D. Edwards*, Assistant Director of Research, Aluminum Co. of America, New Kensington, Pa.
3. "The Application of X-ray Diffraction to Electroplating Problems." *Herbert R. Isenberger*, St. John X-ray Service Inc., Long Island City, N. Y.
4. "The Filtration of Electroplating Solutions." *Dr. Walter R. Meyer*, Bridgeport Branch. Editor, *Metal Industry*, New York, N. Y.

FOURTH SESSION — TUESDAY EVENING, JUNE 20TH — 7:30 P.M.

JOSEPH UNDERWOOD, Presiding
President, Philadelphia Branch

1. "A Study of Electrolyte Films." *Dr. A. Kenneth Graham*, Philadelphia Branch. Consulting Engineer, A. Kenneth Graham & Associates, Jenkinstown, Pa.

Harold J. Read, Instructor Electrochemistry, University of Pennsylvania, Philadelphia, Pa.

2. "The Story of Steel for Electroplating." *Frederick Fulforth*, Philadelphia Branch. The Proctor Electric Co., Philadelphia, Pa.
3. "The Modern Generator and Rectifier." *Guerin Todd*, Chief Engineer, Hanson-Van Winkle-Munning Co., Matawan, N. J.
4. "Time Pieces — From Sun Dial to Wrist Watches." *L. A. Critchfield*, Philadelphia Branch. Hamilton Watch Co., Lancaster, Pa. This will be of interest to the ladies. The Hamilton Watch Co. are loaning their collection of Time Pieces for this paper.

FIFTH SESSION — WEDNESDAY EVENING, JUNE 21ST — 7:30 P.M

JAMES W. HANLON, Presiding
President, Chicago Branch

1. "Addition Agents in Electroplating Processes." *Dr. Frank C. Mathers*, Professor Electrochemistry, University of Indiana, Bloomington, Indiana.
2. "A Review of Finishing Methods." *Mr. Gustav Klinkenstein*, Newark Branch. Vice President and Technical Director, Maas and Waldstein Co., Newark, N. J.
3. "Agitation." *Donald Wood*, Boston Branch. Reed and Barton, Taunton, Mass.
4. "Adhesion of Electrodeposits." *Frank C. Mesle*, Oneida Limited, Oneida, N. Y.

SIXTH SESSION — THURSDAY MORNING, JUNE 22ND — 9:30 A.M.

RALPH J. LIGUORI, Presiding
President, New York Branch

1. "The Effect of Certain Wetting Agents upon Nickel Deposit." *C. B. F. Young*, Ph.D., New York Branch.
2. "Practical Suggestions for Efficient Plating Room Lay-out." *D. R. Hartshorn, Jr.*, Springfield Branch. Chemist, Westinghouse Elec. & Mfg. Co., Springfield, Mass.
3. "Summary of Researches on Electrodeposition at the National Bureau of Standards." *Dr. William Blum*, Baltimore-Washington Branch.
4. "Porosity Tests for Nickel Coatings on Steel. *P. W. C. Strausser*, Research Associate, A.E.S., at Bureau of Standards.
5. "Dropping Tests for Zinc and Cadmium Coatings on Steel." *A. Brenner*, Chemist, Bureau of Standards.
6. "Further Study of Measurements of pH in Alkaline Plating Solutions." *M. R. Thompson*, Chemist, Bureau of Standards.
7. "A Study of Silver Plating for Industrial Applications." *C. S. Love* and *A. C. Simon*, Metallurgical Division, Bureau of Standards.

SPRING FROLIC AT LEACREST. BOB LEATHER HANGS UP THE WELCOME SIGN. R. S. Leather, president of the Lea Mfg. Co., has set the date for the next Leacrest party for Saturday, May 13.

These events coming in the spring and autumn are growing more and more popular each year. All platers and their friends are invited. The place—Bethlehem, Conn., one of Connecticut's beauty spots. The object—fun for Everyone. Refreshments. Games. A good opportunity to meet old friends and make new ones. The time—All afternoon and evening, Saturday, May 13. Bring a friend.

Membership Campaign

April 1, 1939

Branch	Elected	Reinstated
Detroit	96	4
Philadelphia	33	2
Chicago	32	
St. Louis	31	
Grand Rapids	27	2
Buffalo	20	
New Haven	20	
Cleveland	17	
Newark	16	1
Toronto	11	1
New York	10	5
Dayton	9	1
Milwaukee	9	
Bridgeport	9	
Los Angeles	8	
San Francisco	6	
Boston	6	1
Hartford	5	
Cincinnati	4	
Pittsburgh	4	1
Providence-Attleboro	4	1
Rochester	3	
Toledo	3	
Binghamton-Syracuse	2	
Springfield	2	1
Waterbury	2	
Anderson	1	
Montreal		2
Baltimore-Washington		

The Use *of* Ferric Sulfate *for* Pickling Copper Alloys

By
LOUIS F. LOUTREL, JR.
Monsanto Chemical Company

Read before Waterbury Branch
February 8, 1939

THE pickling of metal to secure a clean surface is an important step in most metal processing. It may be necessary because of a previous treatment such as annealing or because the metal surface has oxidized slightly on exposure to air. In either case, the metal after pickling should have a thoroughly clean surface and be as free as possible from pits or etched surface. There should be no film which will interfere with the production of a uniform protective coating on electroplating nor any fine particles of foreign matter which might be forced into the metal surface should it receive further processing such as rolling or drawing.

General practice is to consider the metal suitable for further processing when, there is no visible scale remaining and, after rinsing, the water runs off the surface evenly leaving a uniform film unbroken by streaks or patches.

The problem of securing such a surface is so intimately tied up with the treatment the metal has previously received that it is nearly impossible to discuss it without reference to these previous treatments. In this discussion of pickling it will be linked particularly with scales which have been formed in heat treating the metal.

Let us first examine the common chemicals which are available for pickling. These may be divided into two classes—non-oxidizing acids of which Sulfuric Acid and Hydrochloric (Muriatic) Acid are the two regularly used and oxidizing agents. In this latter class fall Nitric Acid, Sodium Dichromate and Ferric Sulfate.

The common acids are particularly efficient for pickling metals which lie above hydrogen in the electrochemical series and do not form a protective coating in acid media. A familiar example is the action of Sulfuric Acid on steel with the evolution of hydrogen. Here the reaction probably takes place in two steps, the first

being the action of hydrogen ions from the acid on the metal to form iron salts and atoms of hydrogen.

These atoms then combine to form hydrogen gas which is evolved. It is believed that the second of these reactions proceeds much slower than the first thus limiting the rate of attack.

On metals below hydrogen in the electrochemical series Sulfuric and Muriatic Acid have a very slight rate of attack. Initially the reaction of Sulfuric Acid with copper, for example, probably proceeds as with iron forming copper ions in solution and atoms of hydrogen. This leads to a building up of hydrogen atoms on the surface of the metal with a consequent increase in the potential of hydrogen. Before the hydrogen ions start to combine to form hydrogen gas their potential becomes equal to that of the metal copper in the same solution of Sulfuric Acid and the first reaction ceases. Corrosion stops.

In order for the corrosion of copper to take place some other means of removing this hydrogen must be supplied. To a certain extent oxygen of the air will do it as is illustrated by the following experiment.

Two pieces of copper were immersed in separate 6% solutions of Sulfuric Acid. Through one was bubbled oxygen, through the other hydrogen, the sample being arranged so that the acid adjacent to the metal surface was continually saturated with either gas. The loss of weight of the pieces was measured at the end of five hours. It was found that under oxygen the corrosion amounted to 0.149 inches penetration per year while under hydrogen it was but .0023 inches penetration per year.

A more satisfactory method is to use one of the chemical oxidizing agents, Nitric Acid, Sodium Dichromate, or Ferric Sulfate.

Let us examine the mechanism by which each of these work. In Nitric Acid we have a nitrogen atom with five positive atomic charges, capable of giving up these and being reduced to Nitric oxide in which it holds but two positive charges. With atomic hydrogen the reaction would be represented:

$$3H + HNO_3 \rightarrowtail NO\uparrow + 2H_2O$$

The product NO, a poisonous gas, is converted to NO_2 by oxygen of the air and the latter is responsible for the brown color of the fumes arising from a Nitric Acid pickling tub.

In Sodium Dichromate the oxidizing medium is chromium

which combined in this form has six positive charges. When reacting with atomic hydrogen in acid solution it gives up three of these to form chrome sulfate.

$$Na_2Cr_2O_7 + 4H_2SO_4 + 6H \rightarrow Cr_2(SO_4)_3 \cdot Na_2SO_4 - 7H_2O$$

The active oxidizing agent in Ferric Sulfate is the ferric ion which has three positive charges. In a reaction it is reduced to the ferrous form giving up one charge. The reactions in pickling copper could be represented by the following equations—

$$\underset{\text{metal}}{Cu} + \underset{\text{ions}}{2H^+} \rightarrow \underset{\text{ions}}{Cu^{++}} + \underset{\text{atoms}}{2H}$$

$$2H + Fe_2(SO_4)_3 \rightarrow 2FeSO_4 + H_2SO_4$$

Actually the reaction probably takes place through the hydrolysis of ferric sulfate to form ferric hydrate and sulfuric acid with a subsequent reduction of the ferric hydrate to a ferrous hydrate.

Comparing the drop in positive charge of these three chemicals it is seen that Ferric Sulfate when employed in an oxidation reaction can lose but one positive charge per atom of iron, whereas the nitrogen in Nitric Acid and Chromium in Sodium Dichromate can each lose three. Consequently we should expect the action of Ferric Sulfate to be milder than that of mixtures of Dichromate with acid or of mixed Sulfuric and Nitric Acid in a reaction of the type involved in the corrosion of copper. This is borne out in the laboratory. The initial corrosion rates of 20% Ferric Sulfate, 10% Dichromate with 10% Sulfuric Acid, and a standard Bright Dip Mixture (1 volume Sulfuric Acid 66° and 1 volume Nitric Acid 38°) on copper were compared. It was found that at 25°C. the rate of attack of 20% Ferric Sulfate amounted to about .25 gm. per sq. ft. per min., that of the Dichromate mixture .6 gm. per sq. ft. per min. and that of the standard Bright Dip about 1.5 gm. per sq. ft. per min.

The fact that the reaction, while vigorous, proceeds more slowly than with other oxidizing agents led us to believe it would be more amenable to control and consequently that metal losses on pickling would be cut down and smoother finishes secured. Therefore, when Anhydrous Ferric Sulfate, a buff colored salt, granular in form, became commercially available under the trade name Ferrisul, we undertook to determine the optimum concentrations for its use in pickling operations of this type where an oxidizing

chemical is required. In doing this we set as a standard an absolutely clean surface of reasonable lustre. We tried in so far as possible to also determine optimum concentrations of Dichromate and Sulfuric Acid for the purpose of comparison.

L. E. Price and G. J. Thomas, "Oxidation Resistance in Copper Alloys" *Journal Institute of Metals*, Vol. **5**, Part 6, June 1938, grouped the alloying elements with copper into three classes; those imparting a fair resistance to oxidation (tin and zinc), those imparting a high resistance to oxidation (silicon), and those giving the alloy a very high resistance to oxidation (beryllium, aluminum, and magnesium).

The use of Ferrisul in pickling correlates well with this classification.

Considering the common alloys in the first group we have the following common brasses—60 Copper 40 Zinc, 67 Copper 33 Zinc, 70 Copper 30 Zinc, and the red brasses containing 85 Copper 15 Zinc and 70 Copper 10 Zinc. Generally Sulfuric Acid can be satisfactorily employed for the removal of scale from the lower copper alloys of this group. This may at first appear surprising but the reason is readily seen from a consideration of the analysis of the scales which are formed.

J. S. Dunn, "Oxidation of Some Copper Alloys" *Journal Institute of Metals*, **46**: 25-52 (1931), examines the composition of the scale formed on these lower alloys and finds it to be almost entirely zinc oxide. For example, the scale formed on annealing a 70-30 brass sheet in an atmosphere of oxygen at 725°C. gave a scale that was 97% ZnO and 3% Cu_2O while that from a 67-33 sheet annealed at 800°C. contained only 1% copper in the oxide. It is believed that the oxidation proceeds in the following manner. The oxide first formed serves as a protective coating through which further oxygen must pass to oxidize the metal surface. While this is taking place zinc from the metal is diffusing to the metal surface and reducing the copper oxide which has been formed with the formation of zinc oxide. This zinc oxide is more impervious to the transmission of oxygen so that the oxidation of the metal surface decreases and the reduction of copper oxide by zinc increases. The result is an oxide rich in zinc oxide which may frequently be easily pickled in Sulfuric Acid alone.

There are, however, several factors which tend to increase the

copper content of the scale. A lower temperature of annealing is one. The presence of sulfur in the annealing atmosphere is a second. The presence of chlorides in the annealing atmosphere is a third. It has been found, for example, that, when annealing 60-40 brass, the presence of .23% HCl in the annealing gasses will give a very heavy scale containing 58% Cu. Sulfides in the annealing atmosphere may be caused by roll oil on the sheet or on brass that has been tarnished by an atmosphere containing SO_2 or acid vapors.

The use of Ferrisul in instances such as this is desirable. A mixture of 4% Sulfuric Acid and 3% Ferrisul at room temperature gives excellent scale removal. If a brighter surface is desired a solution of 25% Ferrisul should be used, also at room temperature, as a dip following the regular pickling.

As the copper content of brass increases from 76% copper to 82% copper a noticeable change takes place in the character of the oxide. Alloy containing 85% or more Cu have a scale in which the ratio of copper to zinc is the same as that in the metal. Probably in the formation of the oxide, the first oxide formed is sufficiently high in copper oxide to permit ready transmission of oxygen. This together with the fact that the metal is poor in zinc never allows the reaction $Zn + CuO \rightarrowtail ZnO + Cu$ to reach a proportion where the ZnO predominates.

As would be expected, alloys of this composition are difficult to pickle in Sulfuric Acid. High temperatures are required to attack the scale and the copper oxide is not dissolved but remains as a red smut upon the metal. In these cases too an oxidizing agent such as Ferrisul is beneficial. Our work has indicated that a dip in 25% Ferrisul following the Sulfuric pickle will remove the red smut. On the 85-15 alloy a temperature of 50°C. is employed, on the 90-10 a temperature of 80°C.

Particularly in the finishing of brass articles, it is often desirable to get the highest possible lustre. For this purpose concentrated mixtures of Sulfuric and Nitric Acids are customarily employed. In our work we attempted to duplicate the very bright finish obtained with these "bright dip" mixtures using Ferrisul as a substitute for Nitric Acid. This we were unable to do though a strong 40% solution used in a two to three second dip at 80°C. gave a quite bright finish. We believe the high lustre obtained with Nitric-Sulfuric Bright Dip mixtures is due

to the very rapid rate of attack which these possess which results in a more uniform attack of the surface, while Ferrisul solutions with lower rate of etch tend to localize more at the grain boundaries.

Passing on to the second grouping of the copper alloys, those containing silicon we meet the silicon bronzes. It has been experimentally shown that the addition of 4.5% Si will reduce the oxidation rate of pure copper by 75%. Tests were carried out at 725°C. The scale in this case appeared to be in two layers and when the outer one was disintegrated with Muriatic Acid a dull transparent film remained that was probably silica.

A different type of scale is formed when annealing at 827°C. The oxide contains practically no silicon and the oxidizing rate was comparable with that of copper. It is found, however, that there is a silicon dioxide scale imbedded in the pores of the metal, formed probably by the diffusion of oxygen into the copper. This is a type of scale that is very difficult to remove.

In removing scale from these alloys it is necessary to employ an oxidizing agent to attack the copper constituents and a hydrofluoric acid to attack the silica scale. The mixture commercially used consists of 20% Ferrisul together with 2% Hydrofluoric Acid. Temperatures in this case are 50°C. to 60°C. It is, however, possible on some of these alloys to secure scale removal with Ferrisul alone. Here 20% Ferrisul is used and probably serves to attack the copper constituents in such a way that the silica scale is removed mechanically.

The third group, Copper and Beryllium or Aluminum is most resistant to attack. In the case of the Beryllium alloy containing 2% Beryllium, the Beryllium oxide component of the scale is extremely difficult to dissolve. Hot concentrated Sulfuric Acid and Hydrofluoric Acid are the most successful chemicals for this purpose. We have found the addition of 3 to 5% hydrofluoric Acid to a solution containing 30% Ferrisul gives a pickle capable of loosening the most resistant Beryllium Copper oxides. In connection with the use of Hydrofluoric Acid, Ferrisul is very advantageous since it does not drive the Hydrofluoric Acid from solution but rather enters into equilibrium with it to form a Ferric Fluoride.

If a high finish is desired on these alloys the pickle should be

followed by a short dip in a Nitric Acid Sulfuric Acid Bright Dip mixture.

Another class of copper alloys which we have not as yet considered are the nickel-silvers.

On these a straight pickle in Sulfuric Acid tends to leave the metal with an adhering film of nickel hydrate. The addition of 15% Ferrisul to the Sulfuric Acid removes this or the same end may be accomplished by a second dip, following Sulfuric Acid pickling in a 25%-35% solution of Ferrisul at 80-90°C.

The pickling of these last two alloys brings out a point which I feel is often over-looked, the advantage of employing a two or three stage pickling process. Sulfuric and Muriatic Acid are the cheapest chemicals which are available for pickling and in nearly all work there is a certain portion of the pickling which they are capable of doing. It is therefore economical to use one of these chemicals for the first attack on the scale and finish off with the more expensive oxidizing agents to give the desirable finish.

To sum up the use of oxidizing agents for the pickling of copper alloys it may be well to tabulate the advantages and limitations of the three commercial oxidizing agents which are now available for pickling.

First, we have the old standby Nitric Acid.

We may list as advantages:

1. Concentrated mixtures of it and concentrated Sulfuric Acid (sometimes with slight additions of Muriatic Acid) give the brightest finishes on brass.

2. It has the most rapid rate of attack on the copper alloys.

It has certain limitations:

1. It is a hazardous chemical to handle. The burn is painful and the fumes very poisonous.

2. Its use for pickling leads to excessive fuming.

3. Its action cannot always be controlled and may lead to pitting or etched surface.

Second: Sodium Dichromate.

Advantages:

1. It is a salt and easy to handle.

2. There is less fuming than from a Nitric Acid bath.

3. The very yellow color of the metal pickled in Sodium Dichromate is on certain items desirable.

Limitations:

1. Sodium Dichromate decomposes on standing.

2. There is a marked tendency to stain when using Sodium Dichromate pickling baths.

Third: Ferrisul (Anhydrous Ferric Sulfate).

Advantages:

1. It is a dry granular salt easy to handle.

2. There are practically no fumes from a Ferrisul pickling bath.

3. It does not deteriorate on standing.

4. Much of the staining with Sodium Dichromate can be eliminated.

5. The action of Ferrisul is mild. Therefore, pitting and etching can be reduced to a minimum.

6. It can be used with Hydrofluoric Acid without volatilizing the acid.

Limitations:

1. The very bright finish obtained with Nitric-Sulfuric Bright Dip mixtures cannot be secured.

2. As light yellow a finish as secured with Sodium Dichromate cannot be secured on the low brasses.

As a result of our laboratory and plant work we believe that Ferrisul may be advantageously employed in the following types of work:

1. Pickling of copper alloys that cannot be pickled in Sulfuric Acid.

2. As an addition agent to Sulfuric Acid to accelerate the rate of pickling.

3. As a second step to Sulfuric pickling to remove stains or residues remaining from this operation.

4. To replace Nitric Acid or Bichromate where used in conjunction with Sulfuric to produce a clean surface.

A Paper *on* Nickel Plating

By JOSEPH G. STERLING
General Electric Company

Read at Bridgeport Branch Meeting
April 7, 1939

NICKEL PLATING has been a subject of special interest to electroplaters and chemists due to being widely employed in the metal finishing industry. Its importance may be recognized in the value of protective and decorative finishes on steel, including non-ferrous metals such as: brass, copper, zinc, and aluminum. While many nickel plating solutions are in use today, this paper is primarily interested in the hot nickel or Watt type nickel solution which is now a standard commercial bath. The formula of this bath is not a secret one, and any electroplater or chemist may use it to produce a nickel finish necessary to specified requirements.

This paper is written based on experiences the writer has had with the hot nickel plating bath during the past fifteen years and on the following pages I will endeavor to illustrate the good and bad points.

My first contact with the hot nickel bath was around 1924. Previous to this, my experiences with the nickel bath were then the so-called ordinary type of bath, the double nickel sulfate solution, used at room temperature. While the double nickel sulfate bath had its merits and qualifications, I knew the Watt type bath was superior, after working with it for less than a week. The first thing I found was the deposit obtained in less time was just as good or better for buffing. This I speak from experience, as I was a polisher and buffer before getting into the plating business. In the old way of plating with the double ammonium sulfate solution we plated about one to one and a half hours to get a satisfactory deposit using about five amps to a square foot. Using the Watt type solution we were able to get fifteen amps to a square foot and a satisfactory deposit on in a half hour. The ammonium sulfate solution was comprised as follows:

Single Nickel Salts	10 oz. per gallon
Double Nickel Salts	3 oz. per gallon
Ammonium Chloride	3 oz. per gallon
Boric Acid	3 oz. per gallon

pH—5.8 to 6.0
Temperature—Room
Voltage—2 to 3
Anodes—95%–97%
Amps—5 to a square foot

The hot nickel solution is comprised as follows:

Single Nickel Salts	35 to 40 oz. per gallon
Nickel Chloride	5 to 7 oz. per gallon
Boric Acid	3 to 4 oz. per gallon

pH—4.8 to 5.8
Temperature—110°F. to 140°F.
Voltage—3 to 4
Anodes—Depolarized 99% plus
Amperage—15 to 25 to a square foot
Bagged Anodes

You can readily see the difference in the solutions and the greater advantages gained by using the Watt solution. Many factors enter into the picture which I shall try to illustrate. Let us forget for a while the double nickel solution and concentrate upon the Watt nickel solution.

With this solution we were able to increase our production schedule three to four times faster. Parts required for buffing were plated in ½ hour, depositing a thickness of .0006″ to .0008″. For parts requiring only white protective finish with a thickness of .0002″ to .0004″ we were able to run these parts through our conveyor in 15 minutes. It is necessary that a close control of the solution is maintained and an analysis of the solution made once a week. No ammonium or sodium salts should be used at any time, because of the tendency to cause hard and brittle deposits. If the pH gets too low, it is corrected with nickel carbonate rather than with ammonia and adding sulphuric acid if the pH gets above 5.8. Filtration of the solutions is important and should be filtered at least once a month with activated carbon. We have found in our experience that if the pH gets below 4.0 the throwing power is affected and will not deposit in recesses as one with the solution being 5.0 or higher.

We all know the evil of "pitting"—commonly called "nickel pits"—and we know some of the causes for this pitting. They are as follows:

Pitting due to unclean surfaces received from the cleaning operations.

Pitting by stirring up dirt in the solution not filtered or properly filtered.

Pitting produced by the deposition and adherance of bubbles of hydrogen. When the bubble hangs on for a considerable period, or forms itself, it makes a place for itself which in time becomes a pit.

The first mentioned pitting can be eliminated by having the parts physically and chemically clean.

The second mentioned, by proper filtration.

The third can be removed by the use of hydrogen peroxide, sodium perborate, nitric acid, and other oxidizers provided these chemicals do not introduce undesirable effects. We have had the opportunity to use both sodium perborate, pH to desired acidity and hydrogen peroxide. Between the two mentioned we prefer using hydrogen peroxide so as not to introduce sodium to our plating bath. Hydrogen peroxide when used intelligently, effectively prevents practical damage to the plate. We have found that one C.C. of H_2O_2 to a gallon of nickel bath added daily will eliminate pitting caused by hydrogen bubbles. It should be added after the work is taken out from the bath and stirred. We have found that after sixteen hours of working the bath, to add the required amount of H_2O_2 and raise the temperature to 50°–55° C. and the next morning you will have no trouble with hydrogen pitting.

We have seen many of the electroplated articles of steel which are thin and the production of a heavy deposit has been often considered difficult, but by controlling the current densities, acidity, and other features of the Watt type bath, heavy coatings are easily deposited. Cleaning operations before plating must be good — there is no question about that — we are able to take any part at random and give it a hammer test or several 45° bends without the plate cracking or peeling. The plating must be ductile and the deposit heavy and smooth for best buffing results without causing danger in cutting through, especially in automatic machine buffing where the effort and strain is harder.

Our polishing operations, where necessary, are of good quality, although most of our steel bought, is of No. 3 good grade finish steel.

The operators and inspectors in our press department are trained to the hazards caused by rough handling, scratching, and damaging of steel parts which eventually are plated and buffed. They know that the scratching and die marking are detrimental and cause extra work in polishing, involves extra expense in many ways, and by this training we have gotten fine returns in the number of rejects. It was interesting to note that in buying No. 3 steel rather than the cheaper steels used in decorative finishes that we eliminated quite a bit of polishing and the buffing efforts were greatly lightened.

Although this paper was primarily intended to present the qualities of the Watt type bath, I thought it would be interesting to mention other features involved with this bath.

I might mention that in using the hot nickel bath we have tried several baths using higher concentrations of salts and chlorides and found all very good. We had one, using it for several years, that was excellent, and the formula is as follows:

70 oz. $NiSO_4$
11 oz. $NiCl_2$
4 oz. H_3BO_3
Temperature—150°F.
5 Volts
Plating time—11 minutes

Close control is very necessary. You will be surprised at the good results received from this solution. Anode to cathode area distance is 20 inches, but I must again repeat, this solution requires careful control.

The plating cycle in our nickel plate conveyor system is as follows:

Degrease—Conveyor degreaser
6 oz.—Our Standard Cleaner
Cold Water Rinse
HCl Acid Dip—25%—No Current
Cold Water Rinse
2 oz. Sodium Cyanide—Elect. Current Agitation
Cold Water Rinse
Nickel Plate—Conveyor
Place on Drying Conveyor
2 Cold Water Rinses
1 Hot Water
Dry in Oven with Steam Coils

Even if we do admit it ourselves, we do get good plating and buffing results and our quality of work is second to none.

Recent Developments in **Barrel Plating** *and* **Rolling**

A Short Talk Given by
MR. JOHN M. BARRY
Plating Supervisor, H. C. Cook
Ansonia, Conn.
to the New Haven Branch of the
American Electroplater's Society

LET us start our round table discussion this evening on the finishing of steel parts from the press through plating and the final finishing operation. We will try to confine ourselves mostly with the finishing of cold rolled steel, wet burnished before plating also with the rolling for burnishing and plating of parts made from carbon steel.

Most of you here tonight are familiar with the rolling of work such as outlined and realize that by having the right abrasive and correct burnishing compounds when given sufficient time you can produce a good finish.

One of the reasons for studying and developing changes recently in the method of handling work preparatory to barrel nickel plating is often brought up because of the very quick deliveries necessitated by low inventories in the average manufacturing plant today. Furthermore, many plants find themselves cramped for sufficient room or lacking the amount of equipment they might desire so that they have to do the best that can be done with what equipment and space there is available. This naturally brings up the question of using the correct material for getting a quality job produced in the best time taking into consideration cost, not only of materials, but also the tying up of equipment and the use of power. Our first problem then is one of selecting the best material. At this point, it is necessary to break the rolling operation down into primary and secondary rolls. Under the system which prevailed in a great many plating departments for years, the primary roll used materials such as, sand and water, or emery and potash and sawdust necessitating rolling operations running anywhere from 40 or 60 hours up to 90 or 100 hours. Recently there has been brought on to the supply market materials which will cut this time not only in half but more than that and permit those responsible for finishing to produce even a better finish than under the older methods.

Our experience today is on two types of work, namely carbon steels which have been heat treated before rolling and plating, and ordinary cold rolled steels which are burnished and plated right from the presses. To refer first to the treatment of carbon steels, work coming from our heat treating department is often soaked in hot water to dissolve hardening or tempering salts. This water is then whirled off and the parts placed in either a vertical or horizontal hex type steel wet rolling barrel. Our experience shows that with barrels of this type the speed of approximately 25 or 30 revolutions per minute works to the best advantage.

We use about 1 bushel of work which usually will run close to 200 lbs. as a batch. After the work has been cleaned from the heat treatment salts, and placed in the rolling barrel, we add a grinding abrasive namely, 2 parts of special type silica and 1 part special type soluble oil. These materials having been recently developed for this particular type of work to facilitate finish, smoothness, lustre, in a minimum of time. Normally a roll of from 4 to 10 hours is the best for a good smooth job. However, where sharp or heavy burrs are prevalent on the work a somewhat longer roll is necessary. You will note that 4 to 10 hours is a decided difference from the old type run of 70 to 100 hours, and our experience has taught us that by the proper selection of rolling materials we are able to save this time and improve our finish over that obtained over the older method.

Now let us consider cold rolled steel parts taken directly from the presses that are not heat treated. These will roll up to a splendid finish in approximately one half the time allowed for those that have been heat treated. The material used and the method being the same as just outlined for the parts that have been heat treated.

After this first rolling as outlined for either heat treated parts or parts which are not heat treated, the following process is approximately the same: Up to now we have been discussing the so-called abrasive roll, an outline of the finishing roll is somewhat as follows: At the end of the abrasive roll hot water is added to the barrels with a small amount of a mild alkaline. The alkaline dissolves the oil in the rolling after approximately 10 to 20 minutes of mixture with the oil.

The next step is to flush out with clear water, (preferable in large volume piped near to the barrels), thoroughly by use of a screen and further rolling, all solutions in the barrel. This requires only a few minutes. Normally 2 or 3 rinses or flushings are desirable where time will permit. We are now ready for our final rolling which we call a burnish roll. Here again the materials used for burnish rolling have changed considerably in recent years. Where formerly leather was prominent or such substances as lime, polyroth, cyanide and soap chips, we have been able by the selection of other material to again save time as well as produce a more lustrous result. We now use a burnishing compound with clear water, (the water being cold), and obtain in 5 to 10 hours of rolling a burnish equivalent to what formerly was obtained in 15 to 40 hours. This burnishing compound seems to be primarily a mild alkaline powder which has a tendency to give the work considerable lustre, whereas some of the other materials tended to put more of a satin finish on the work.

It might be mentioned that on the primary rolling with the silicon and oil, a great deal of work is rolled with steel scrap such as slugs from piercings or cut outs of small irregular shapes from blanking operations. Where these are not available, cones, balls or other burnishing objects are often used but our experience is that slugs and scrap seems to do a better job than the average burnishing medium.

One thing in particular we wish to emphasize is that from the time the work first enters the rolling barrel it is not necessary to remove it until the entire rolling cycle has been completed. Another point which we wish to call to your attention is that the gassing of barrels does not take place as under the older method. This makes for greater safety, not only in the handling of the work, but at all times. Naturally, however, the work should be stopped from rolling and inspected frequently for smoothness of the base metal, and in the burnishing roll for progress in the amount of burnish. As on the burnishing operation our experience has taught that it is possible to roll the work too long and lose the lustre we so greatly desire.

After being removed from the rolling barrel, the work having been flushed from burnishing roll similar to the flushing from the abrasive roll, it is either placed in baskets in a

mild warm cleaner or dried out in the event that it cannot go directly to the plating barrels. When the work is ready for the plating barrels it is run through a 4 ounce per gallon metal cleaner, a cold water rinse, a 20% muriatic acid pickle, through 2 cold water rinses and then into the plating barrel. In the type of work we do at the plant, one or two hours of nickel plating is required depending of course entirely on the outside requirements for deposit of the particular job in question.

A recent experience on a series of tests showed us that some of our work although smoothly rolled to a bright lustrous finish and well covered with a good looking nickel plate, was not standing up on exposure tests as we desired it to. It had not been thought necessary to burnish the work after plating because of the splendid finish obtained without doing this. However, we proved through a series of tests that having followed the outline above and obtained a good plating finish, to take this work and give it a good ball burnish after plating seemed to close the pores of the nickel somewhat so as to withstand considerably more resistance to a porosity test. After trying this on several tests we came to the conclusion that the burnishing of the nickel greatly decreased the porosity of the nickel coating thereby increasing its resistance to the natural elements.

This led us to working out a practical test that we could apply to each batch of work coming through the rolling and plating operation as sort of a porosity test. Our solution is 5 grams sodium chloride, ½ gram ferri cyanide, 1 liter distilled water thoroughly mixed. The article to be tested is immersed in this solution for 10 to 20 seconds. A good exposure will withstand 20 seconds without breaking down. The breakdown shows a blue spotting at the exposed bare metal.

It is well known that all nickel deposits are porous until the thickness of the deposit is at least .001" and that the protection afforded by a nickel deposit depends principally upon the thickness of the coating, therefore rusting occurs where the steel is bare, that is where the nickel coating is porous. Naturally for several reasons our work is not plated to a thickness of .001" deposit for very little of it requires such a heavy coating. Many times expense will not permit where in our judgment we would

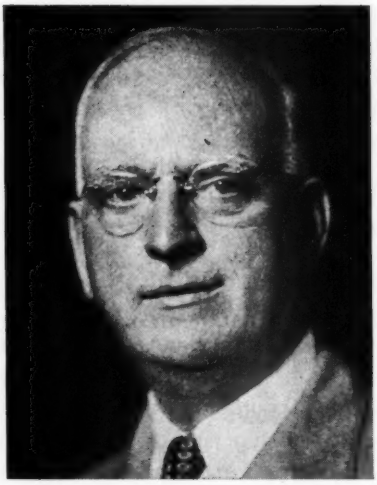
like to give such a coating. We have been governed in our nickel plating to a run of 1 to 2 hours for most of our work, as a result of the methods of rolling and testing of nickel for porosity as outlined above. On some of our special stampings that are submitted to extreme outdoor exposure conditions, a 2 hour plate on top of the rolling outlined above and the burnishing after plate proves quite satisfactory.

We try to keep our nickel solution at 4 ounces per gallon of metal, $3\frac{1}{2}$ ounces of ammonium chloride, $3\frac{1}{2}$ of boric acid, run with a pH of 5.8 to 6.0.

We have been informed on good authority that if we brought the nickel content up to 6 ounces per gallon, we would get a thicker deposit, but our experience has taught us that on cold days there seems to be a tendency for the salt to crystalize. We believe under this condition that it is necessary to heat the solution in the early part of the day's run, but as yet have not worked out a satisfactory experience on this problem. May I emphasize to any who has had the patience to listen to this article or read same, that we would like it to be known that we desire to be of any help to others in connection with similar problems to those outlined. On the other hand we do not believe we have reached the point of perfection and stand open for constructive criticism from anybody that can help us. Our attempt has been merely to be of some help in the past, which reminds me of a story that my boss told me the other day:

Some years ago our firm had not had much experience in this type of rolling. They went to another firm in the state of Connecticut with a great deal of experience and for some months had some of their products rolled by the outside firm. Later, after developing the rolling to the point where it was satisfactory for our requirements and to a point which was beyond that which the outside firm was able to show us, we had the pleasure one time of running a test lot of work for this same outside firm and the satisfaction of knowing that the results obtained were better than those produced by the outside firm in less time than we understand they had been using. Which all proved that none of us know whereby we can help the other fellow and in turn get help ourselves.

International Fellowship Club



Frank J. Clark

SUBJECT: OBJECTIVES A TWO-POINT PROGRAM, SOCIAL AND SALES ETHICS

The opening article under the heading of the International Fellowship Club was well presented by our first president, Mr. Wilfred S. McKeon in the December issue.

He outlined the objects as visualized by the founders and anyone who has attended an A.E.S. Convention appreciated the hospitality extended on the opening night.

Good Fellowship prevails and the new delegates and friends are made to feel that a warmth of comradeship is ever present that tends to promote this rapidly growing industry of ours.

As the evening's entertainment progresses, it is evident beyond question that the social objective of the International Fellowship Club has been attained and great credit is due to the manufacturers and distributors who have made it possible by their generous contributions.

As one of the original four who sat up into the wee small hours of the morning, discussing the idea, it has occurred to me that we discussed one other important objective to strengthen the social arm of our membership, viz., sales ethics.

It is surprising as I look back that in a great measure we have definitely obtained success along these lines and our industry owes a debt of gratitude to

those engineers and salesmen whose duty it is to bring to the trade products at reasonable prices and an unparallelled service.

For this high standard obtained, they have been amply rewarded by a realization that no other industry has achieved a like result in so short a time.

I am firmly of the opinion that, due to this success we now all receive from purchasing agents, engineers, chemists, and platers a hearty welcome, because of the confidence inspired and the wealth of information you are able to bring to their ever-pressing problems.

It has been my good fortune to have promoted many new products to our industry for its betterment.

I refer to generators having the improved metal carbon type brushes, full automatic and semi-automatic conveyors, plating barrels, the first high purity nickel anodes, electric cleaning processes, the use of nickel chloride as a conducting salt, and bright nickel plating processes.

Manufacturers and research organizations are duly credited for these improvements and they have placed in the hands of their sales engineers the necessary information for a well-rounded out presentation of these new products.

This to me, represents their appreciation of the needs important in promoting sales ethics on a large scale, and we all must try to uphold them by giving their efforts a positive enthusiasm and a negative degree of criticism.

I like to feel that criticism usually is negative when referring to the new products that are not of our own manufacture, but highly constructive or positive if we who are in the field can co-operate by adding a few words of encouragement for those who have labored long in the vineyard of research development.

Several years ago I heard a splendid address by a well-known purchasing agent who identified the different types of salesmen who called on them.

He was asked, "when do the executives of your company congratulate you?" and he replied, "Not very often as congratulations were reserved for the sales manager."

In confidence he stated congratulations came to him only on occasions when he was able to break down a price set-up, or at least make an effort to do so.

We are only the appointed ambassadors between our home office and the purchasing agents, and we should always have the courage to report that the order was lost to the other fellow not because he cut prices but due to a better presentation of his proposition and the services he would render.

In conclusion I wish to congratulate the membership of the International Fellowship Club for the high degree of efficiency that they represent to the electroplating industry, and to welcome those who are not members to sit down with us at our luncheon on the first day of the A.E.S. Convention to be held at Asbury Park in June.

FRANK J. CLARK.

REPORT OF THE MEETINGS OF LOS ANGELES AND SAN FRANCISCO BRANCHES

By George B. Hogaboom

The Los Angeles Branch held an all day Session on Saturday, March 25th, at Hotel Roosevelt, Hollywood. On Monday, March 27th, a talk was given at Hotel Rosslyn, Los Angeles.

The meetings were well attended and there was considerable discussion that brought out the many new developments in electroplating.

The San Francisco Branch held an informal dinner at the Athens Athletic Club, Oakland, Cal. on Friday, March 31st. This was in charge of Mr. J. C. McCallum and Mr. L. W. Miller.

There were about 100 present at the dinner and several came in to hear the talk. The discussion that followed was most interesting. Mr. Hugh Morgan by his inimitable manner in asking questions and his many inquiries added materially to the success of the meeting.

The talk was "What Is Under the Plate".

On Monday, April 3rd, another meeting was held in Oakland at which about 125 were present. The talk was illustrated and all the recent developments in plating were discussed. The questions asked were of much value and as at the previous meeting it was a very late hour before the meeting adjourned.

I wish to thank the National Society for the honor and privilege of being sent to attend the above meetings. What small labor there was to preparing the talks and giving them was more than repaid by the interest shown and by the splendid reception given Mrs. Hogaboom and myself. My only wish is that those who attended the meetings received as much as I did. When it comes to doing things in a real manner the Pacific Coast Branches can equal any of the Eastern Branches. My sincere thanks are offered to all who made this visit possible.

GEORGE B. HOGABOOM

PAPERS

Degreasing—*W. W. Davidson Vice President Detroit Rex Co.*, Detroit Mich., William A. Vensel, Local Representative.

The development of the methods for removing oils and greases from metals without the metals being attacked was told in a very interesting manner. This thorough and rapid method now called vapor degreasing has been greatly improved by having a combined immersion and vapor units. The solvent used is Trichlorethylene a heat vaporization of one-ninth of that of water and consequently with a well constructed unit the loss of the solvent is very small. The attack of the pure solvent on metals has been retarded by an inhibiting agent of which there is one for ferrous and one for non-ferrous metals.

The equipment is designed for cleaning by vapor, immersion or a three phase unit, immersion, spray and vapor.

That the electroplating and metal trades have generally adopted this method of cleaning metals was well illustrated by the many units in the industry that were shown by two reels of moving pictures. The story was well told and the illustrations confirmed all that was claimed for the process.

High Speed Copper Plating — *D. N. Eldred.* A paper prepared by F. Oplinger was read on the new DuPont copper plating process. This has been adequately told by the author at several branches of the A. E. S., and written up in trade magazines. The process well deserves the reception and success it is having.

Value of Research In The Electroplating Industry — *M. D. Rynkofs.* The progress of the research work of the A.E.S., was told in a very descrip-

tive manner. It was emphasized that unless platers become acquainted with the fundamental principles of electroplating that they could not expect to keep step with the progress made. Research tells what can and cannot be done with the existing 97 elements. The big problem before platers today is that of protection against corrosion. Credit was given Mr. Frank J. Hanlon former National President and Editor of MONTHLY REVIEW, who was present for the starting of A.E.S. research work.

Bright Nickel — *P. R. Pine*, Harshaw Chemical Co., Read by Harold J. Kroesche. Bright nickel has passed through various phases of development. It has been cussed and discussed by a large number of platers. Close chemical control has brought bright nickel solutions to practical commercial practice and there is no doubt of its future success. The properties of the deposit was told and reasons for the bright finish discussed. It is harder but somewhat less ductile than white nickel. The chemical construction of the plating solution was described. It is essential that the operator understands methods of control and operation so that the important phases of the process can be maintained.

Modern Cleaning Processes — *E. R. Hohnan, Chemist Turco Products Corp.*, Los Angeles, Cal. Read by F. E. Goldsmith.

The history of the development of soaps and detergents were described in a most unusual manner. The story was unique and there was every evidence of considerable detailed research on the subject of cleaning by the author. The author started with the Romans who scraped dirt off with a sharpened tool and then rubbed oil on the skin to restore it. In the ruins of Pompeii a complete soap factory was found. The real development of our modern soap was in about 1823 when a mixture was made of a fat and an alkali.

The several methods in general use for cleaning metals was described and the materials used defined and their properties discussed in detail.

A more interesting paper on the subject would be difficult to write.

"What is Under the Plate" — *George B. Hogaboom.* This paper received so many comments when presented at several of the A.E.S. Branches that the Los Angeles committee requested it be told at this meeting. The story is too well known to comment. About 150 attended the meetings and the attention shown was indicative of interest of the platers on the Pacific Coast in the progress of electroplating.

About 250 were at the banquet and this climaxed one of the finest of days.

The committee of which Mr. Ernest Lamoureaux was chairman cannot be complimented too highly for their work.

On Monday evening, at Rosslyn Hotel, 125 platers met to hear an illustrated talk on the several problems that have been developed during the past few years. After the talk questions were asked until it was almost midnight.

The Los Angeles Branch members are as progressive as any of those of Eastern branches and from the visit to their plants they have every reason to be proud of their progress.

LOS ANGELES. The Los Angeles Branch of the American Electroplaters Society held their annual Educational Session at the Roosevelt Hotel, Hollywood, California, March 25, 1939.

Mr. Vensel and Mr. Davidson opened the meeting at 10 a. m. with a paper on Vapor Degreasing. The paper read by Mr. Vensel discussed the technical aspects of the vapor degreasing process in unusual detail. This was followed by colored motion pictures illustrations with explanatory remarks by Mr. Davidson, of the Detroit Rex Co.

11 a. m. Mr. D. N. Eldred of the E. I. DuPont Co., read a paper by Mr. Oplinger, of the same company, on "Bright Copper Plating". The paper discussed a series of experiments exploring the influence of various ingredients employed in copper plating. The conclusion of this research work points the way, very naturally, to the unusual composition of the new DuPont Bright Copper Solution.

12 noon. Intermission.

1 P. M. A talk by Mr. M. D. Rynkofs. "The Significance of Research" in the Electro-plating Industry. Mr. Rynkofs read an outline of the work proposed by the Research Committee, and likewise described researches in his own particular field on the subject of preservation of bodies after death, by means of copper plating.

2 P. M. Mr. Harold J. Kroesche. Topic — "Bright Nickel Plating" Mr. Kroesche read a paper prepared by Mr. P. R. Pine of the Harshaw Chemical Co., describing the logic behind the bright nickel plating processes, which are finding increasing acceptance in the electroplating industry.

3 P. M. Mr. S. E. Goldsmith, of Turco Products, Inc., read a paper on the dubject of cleaning processes. This paper took up the development of the cleaning processes from pre-historic times to the present day. It showed how in spite of its old traditions and ancient history, the cleaning process is keeping in step with other developments in the electro-plating industry. An example of a mechanical device for automatically maintaining the effective strength of a cleaning solution was described.

4 P. M. Mr. George B. Hogaboom, Chairman of the A.E.S, and recognized as one of America's outstanding authorities on the science of electro-plating. Mr. Hogaboom presented a discussion on "What is under the plate", illustrated with micro-photo slides. The subject dealt with failures of electro deposited coatings caused by conditions of the basis metal that are overlooked by the unsuspecting plater.

5 P. M. Meeting adjourned.

7.30 P. M. Dinner dance and Entertainment in the Blossom Room of the Roosevelt Hotel. There was a fine display of plated ware and over a hundred useful door prizes won by those with the lucky numbers. Festivities ended at 2 a. m. and a gala time was had by all.

Guests from distant points:—Mr. and Mrs. Frank J. Hanlon of Chicago; Mr. and Mrs. Geo. B. Hogaboom of New Jersey; Mr. Joe Levoy of San Francisco.

Sunday, March 26th: Auto tour of Los Angeles and environs, winding up at the gambling ship "Showboat" off Long Beach—never to be forgotten, never, never, never! Ask George Hogaboom.

Monday, March 27th: Tour of Hollywood bright spots: (1) RKO studio in Hollywood. (2) Allied Phonograph Record Co., Inc., demonstration of electro-metallized wax impressions. (3) New NBC studios with voice test and play back. Left premises just in time to miss Eddie Cantor riot incident. 6:30 P.M., dinner at the Rosslyn Hotel. 7:30 P.M., Mr. Geo B. Hogaboom. Topics: Hot alkaline solutions. Electro-deposition of Iron and Rebuilding of Worn Parts, by this method. Both subjects profusely illustrated with lantern slides.

Tuesday, March 28th. (1) Trip through the Don Baxter Lab., Glendale, demonstrating the "panchronizing" process, a vacuum process of depositing aluminum and magnesium upon chromium-plated surfaces at a temperature of 800 degrees F. (2) Trip through the General Electric Co., Pacific Coast Div., Ontario, California, demonstrating a completely conveyorized polishing, cleaning, pickling, nickeling, buffing, chromium plating, finish coloring and assembly.

RAYMOND SOLIVAN.

Here and There

MONTREAL BRANCH'S regular meeting was held at the New Carlton Hotel on Thursday evening, March 30. A supper was served after which president R. E. Gordon declared the meeting open for business. Secretary John T. Cronin had several communciations to read after which the Executive Secretary was asked to give a few remarks.

A most interesting subject for discussion was the possibility of increasing the branch membership. It was agreed by all present that, inasmuch as there are so many French speaking platers in Montreal, who would like to join the A.E.S., but feel a lack of interest because all the meetings are conducted in English, that they be encouraged to hold a meeting of their own each month under the auspices of Montreal Branch.

In this way plating problems and other items of interest could be discussed in their own language. A committee was appointed to find out the feeling of the French speaking platers regarding this suggestion. Election of officers was held, Mr. Charles Doherty, former branch secretary was elected president and Mr. Cronin was reelected as secretary.

We were very sorry to miss seeing Past Supreme President John H. Feeley who was in New York on a business trip.

Somehow we don't have much favor with the weather man when visiting Montreal. It snowed all the time we were there.

We like the Spirit of Montreal Branch members especially the younger members. There is a fine feeling of optimism, their meetings are lively and they don't shirk responsibility. Accept our best wishes as you try to solve the racial problems so that the A.E.S. will be a distinct benefit to all.

BRIDGEPORT BRANCH — This is one of the many branches we like to visit. There is a warm feeling here that is not spoiled by too much dignity. All the members feel free to throw off the cares of the shop and office and come prepared to enjoy themselves.

President Joe Sterling of the General Electric Company read a paper on nickel plating which is published in this month's REVIEW.

Then there was election of officers.

Bill Ehrencrona was unanimously elected president. Bill said he would give the vice president Ed. Charleson more to do than Joe Sterling gave him as Vice President.

Vice president Bill Flaherty one of our best and most conscientious secretaries felt as though he would to see someone else in the secretary's office so Eugene Phillips was voted the honor. We wish to extend our best wishes to Mr. Flaherty whose courtesy and cooperation the executive secretary hereby acknowledges. To the new secretary we offer our congratulations and pledge our support. We believe Gene can measure up to Bill's standards with the help of all the members.

All of us were sorry that Walter Meyer decided he held the office of librarian long enough, so Mr. Clarence Helmle was elected to fill his place. Dr. Meyer has been a tremendous force in the success of Bridgeport Branch and hardly ever missed a meeting. Before the branch agreed to release him as librarian they made Walter promise that he would still be a regular attendant. He did

and he will. In the election of officers we were very favorably impressed with the cheerfulness and good will with which these men accepted the responsibility placed on their shoulders for the coming year. A vote of thanks was given the retiring officers for their faithfulness during the past year.

NEW HAVEN BRANCH. There was a nice gathering of the members at Sterling Laboratory to greet Mr. W. G. Sheane who has charge of organic finishing at the Bridgeport plant of G. E.

Mr. Sheane gave a most unusual address on the proper methods to follow in applying lacquers. He demonstrated with movies the loss of time and material by some spray gun operators in the improper handling of the equipment. Mr. Sheane also showed with lantern slides and charts, the savings made by the careful instruction of workers, which would add to the latter's pay envelope and at the same time save the employer plenty of expense because of material wasted. Mr. T. H. Chamberlain introduced the speaker. Mr. Sheane was given a big hand at the close of his address.

NEW ENGLAND REGIONAL MEETING

There was a large attendance of the New England membership at Hartford on Saturday, April 15.

Shortly after 2 P. M. the general chairman, Mr. Ernest Bancroft, called the meeting to order and introduced Ray O'Connor as chairman of the Educational Session.

J. E. Charleson of Yale & Towne Mfg. Co. gave a splendid talk on "Finishing Die Castings" as the first speaker. He was followed by T. H. Chamberlain, Chase Brass and Copper Co., who spoke on "The importance of Chemistry to the plater".

Arthur W. Tracy, American Brass Company, Waterbury, chose as his subject "The Corrosion of plated Products", while the last speaker, Mr. A. B. Wilson, Chevrolet Company, Detroit, Past Supreme President of the A.E.S., gave his views on the Research program of our Society past, present, and future. Mr. Wilson's address concluded with a moving picture entitled the story of the grill. All four papers were well received, Mr. Wilson's humorous remarks lending a lot of enjoyment to a most attentive and appreciative audience.

Mr. George Hogaboom was then called upon for a few remarks, the speaker has just returned from a visit to Los Angeles and San Francisco and told of plating being done on the Pacific Coast. Mr. Hogaboom's report is published in another part of this issue of the REVIEW.

Past President Horace Smith was introduced and stated that everything is in readiness for the best annual convention ever held by the A. E. S. Vice presidents Fulforth and Downes were present and were introduced by Chairman O'Connor.

Ralph Liguori, president of New York Branch and Arthur Mintie of Boston Branch were also introduced. Both educationally and socially the event was a distinct success. Every member present entered into the spirit of the occasion.

Ed. Delarm and Andrew Garrett, president and secretary of Boston branch were present, also the secretaries of New York, Newark, and Philadelphia Branches, Messrs. F. J. MacStoker, George Wagner, and Robert Jackson respectively.

Newark Branch members were well represented, twenty-three in all including the ladies came by bus, which they chartered.

The committee is grateful indeed to this delegation, they lent a lot of color to the occasion. They always do, wherever they go.

All the branches sponsoring the meeting were out in force. Practically all officers of the 5 branches were accounted for.

Beautiful compacts were purchased by the committee and presented to the ladies. The Ladies' Committee consisting of Mrs. Bancroft, Mrs. Austin, Mrs. St. Pierre, and Mrs. Grant, had a busy afternoon looking after the visiting ladies welfare. They performed their duties well and we thank them.

A door prize which consisted of an expensive desk set was donated by Maas & Waldstein Company. This was won by one of the young ladies from New Haven Branch, Miss O'Brien.

Mr. R. S. Leather, who has just recently been made an honorary member of Waterbury Branch, donated the programs.

Bob Richmond and his orchestra of Boston provided the music for the dancing whcih lasted until after midnight. A floor show preceded the dancing.

The committee feels that the effort made in bringing the branches together was successful. Many favorable expressions from those present, have convinced us that this should be an annual event. The committee is well pleased with the response to this first attempt to unite the New England Branches at least once a year. Aside from the educational value which is always worthwhile there is the spirit of fraternity and good fellowship that is of inestimable value. Our sincere thanks is extended to all who had any part in making the event both profitable and enjoyable.

HOT SOLUTION PLATING BARREL

A noteworthy advance in plating barrel construction is embodied in the new Mercil plating barrel tank made by the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies. This tank which is designed for hot solutions, employs a unique method of exhausting the fumes. A series of small ducts directly over the anode rods connect with the main duct on the side. These individual ducts do not interfere with the placement of the cylinders into the tank in their respective saddle brackets, nor do they leave any unsightly cumbersome ducts along the side or above the tanks. The unit is neat in appearance, compact and thoroughly effective.

CORRESPONDENTS PLEASE TAKE NOTICE!

The new address of the Executive Secretary
will be 93 Oak Grove Ave., Springfield, Mass.,

AFTER MAY 1st.

FROM THE PHILADELPHIA REMINDER

The March meeting was very well attended by about sixty members and friends of the A. E. S. and E. C. S., to hear Dr. Walter Meyer, editor of *Metal Industry*, pseak on "The Filtration of Plating Solutions".

This subject was very thoroughly covered—more particularly so, as Mr. Helbig of the Darco Corporation was able to accompany Dr. Meyer and spoke briefly about the uses of activated carbon as a filtering medium for the removal of other than solid impurities.

During the discussion, it was agreed that between two and three pounds of activated carbon per 100 gallons of solution was the best amount for positive purification, including organic deterioration products, and the ideal method to first filter the solution through filter aid, to remove solid particles, into a storage tank; then recharge the filter with both filter aid and activated carbon as mixed in the storage tank and refilter back into the cleaned plating tank.

Carbon may also be used in continuous filtration as recommended by Mr. Helbig, but as pointed out in discussion, the plating tank never gets thoroughly cleaned by this method.

A further discussion regarding methods of raising pH and eliminating ferrous iron from bright nickel solutions brought forth the statements that Lister's method and the use of hydrogen peroxide or potassium permanganate would be injurious to some proprietary brighteners and non-pitters, as well as the thought that at low pH it is doubtful if enough ferrous iron could stay in solution to be harmful. More information is requested on these subjects.

On April 24, 1939, at the Harrison Laboratory, Mr. E. A. Anderson of the New Jersey Zinc Company's research division, and a member of Philadelphia Branch, will speak on the "Plating of Zinc Base Die Castings".

Mr. Anderson has published the results of some work along these lines, and in his position as well as his contacts as a member of the A.E.S. research committee, the joint corrosion committee, etc., is in a position to speak with authority on any phase of the subject, so that there should be no unanswered questions by the end of the period.

Remember the nomination of officers occurs at the April meeting.

From the March "Reminder", it is notable that Philadelphia is well represented at the Asbury Park Convention, having no less than three speakers out of a total of twenty-eight, a presiding officer at one evening session and a member of the papers award committee. Such recognition certainly deserves support, so plan . . . The words "Attendance at the Newark Convention", appear on original in form of trylon and perisphere.

Also note that Dr. Read, secretary of the local section E.C.S., has invited our membership to attend their last meeting of this season, to be held at Bryn Mawr college, Thursday evening, May 11, 1939, at 8 P.M., to hear Dr. Miller speak on the uses of a new instrument—the Polarigraph.

An informal dollar dinner will be held at 6 P.M., to which invitation is also extended, provided notice is given Dr. Read, at the Harrison Laboratory, not later than Wednesday preceding the meeting, of intention to attend.

In accordance with the sentiment of the March meeting, the committee consisting of Messrs. Zurbach, chairman, Harris, A. M. Robson and Fulforth, as appointed by the president, have met and propose the following plans:

Delegates to the 1939 Convention are to be invited to come by way of Philadelphia and spend Saturday and part of Sunday as our guests.

Upon arrival, volunteers will meet them with cars at the station and transfer them to a previously selected hotel, where special rates will be secured for the occasion.

The delegates will be supplied in advance with folders describing the historical and other interesting points of our city, from which they will make selection of the places they wish to see. Their member guide will then conduct them in his car to these points and return them to a selected hotel on Saturday evening for a $1.00 dinner, to which the whole membership is invited in order to meet the delegates and supreme officers attending. If possible, music of some kind and dancing will be provided.

On Sunday, a trip to Valley Forge is planned at the discretion of the individual's wishes, followed by a drive to Asbury Park to deliver the delegates at the convention headquarters by Sunday evening.

This whole program is nothing less than the type of entertainment supplied visitors to other branches—notably Chicago last year, who entertained the Milwaukee delegates the previous day, and it behooves us to keep in the forefront of any activities tending toward a better relationship with other branches.

The only cost to the branch will be $1.00 for the dinner for each delegate attending, which total should not exceed $25.00 to $30.00, while the members using their cars for the occasion are not to supply anything other than the gasoline and their services as guides.

It is hoped that these plans will be favorably voted at the April meeting, at which time Mr. A. M. Robson will be glad to accept volunteered automobiles for either the Saturday or Sunday or both days preceding the convention date.

FREDERICK FULFORTH.

THE PLATING AND RUSTPROOFING ASSOCIATION, OF MICHIGAN. The above organization was incorporated under Michigan State laws in 1938. Mr. H. E. Adelsperger, Auto City Plating Co., is president. Mr. W. B. Knight, Knight Plating Co., vice president, and Mr. Frederick R. Bolton, 1532 Union Guardian Bldg., Detroit, secretary.

The organization maintains its own credit bureau, and has committees working on standardization of specifications at the present time.

The membership of the association represents about 83% of the job shop work done in the metropolitan area. They are nearly all members of Detroit Branch, A.E.S., and are strong supporters of the Branch's activities. The main object of the association is to maintain good quality electroplating by standardizing, and to see that all plating is kept up to specifications so as to compete favorably with other products in the electroplating field. With these objectives in mind we wish the association every success in its endeavor to produce high quality plating and rustproofing in the job shop industry.

HARTFORD BRANCH

The Hartford Branch of the A.E.S. held its regular monthly meeting on Monday evening, March 20, 1939, at the State Trade School, Hartford, Conn.

The meeting was called to order at 8:30 p.m., with President Pietro in the chair. Minutes of the previous meeting were read and accepted. All communications were read and placed on file. One letter was tabled until the April meeting.

One associate member, Mr. C. G. Bondesan was granted his resignation. One associate member, Mr. E. L. Wood was granted a transfer to the Springfield Branch.

A committee consisting of Mr. Austin, Mr. St. Pierre, and Mr. Peterson was appointed to take care of the details of a branch exhibit for the National Convention.

A nominating committee was appointed to secure names for office elections for the coming year.

Dr. Walter Meyer, was the guest speaker for the evening, and gave a very fine talk accompanied by lantern slides on "The Filtration of Plating Solutions".

His talked stressed the value of filtered solutions; the present day methods and uses of filter aids and activated carbon. The talk was enjoyed very much, and in conclusion he was given a rising vote of thanks.

The meeting was attended by over forty members, including W. J. R. Kennedy, the executive secretary, and was adjourned at 10:30 p.m.

V. E. GRANT, *Sec'y*

BRIDGEPORT BRANCH

The regular monthly meeting of the Bridgeport Branch was held on Thursday evening, March 2, in the Chamber of Commerce rooms at the Stratfield Hotel. Joseph Sterling, presiding. The president called the members to standing for one minute's silence as a mark of respect and prayer for the departure of one of our members Stephen Pribesh.

The minutes of the last regular meeting were read and accepted. The roll call of officers was read, Ray O'Connor was absent.

The sick committee reported that George Karl was recovering from a recent illness, and that Ben Kusterer was on the mend after an injury.

The secretary was instructed to send a letter of condolence to the family of Stephen Pribesh.

A communication was read from Dr. Meyer informing the members of the regional meeting to be held in Hartford, Conn., at the Hotel Bond on April 15.

Mr. Joseph Sterling reported progress on the work of exhibits for the coming convention.

A communication from Mr. Joseph Downes that had formerly been read at the February meeting, concerning the platers' exhibits was further discussed, and it was voted that the local branch would co-operate in this project also.

A communication from the Milwaukee Branch was read and discussed.

A communication from Geo. Hogaboom, chairman of the Program Committee was also read.

The Membership Committee reported progress and the following applica-

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tions for membership were presented: active member, Stephen Suhanosky, Casco Co.; Associate members, Herbert Goldeman of the Norman Hoffman Bearing Co., and David Dick of the Yankee Products Co.

The election of officers and delegates to the convention will be held at the April meeting.

Good of the Order: It was voted that the branch send a check of $50.00 to the family of the late Stephen Pribesh.

At the meeting on March 16 and again in April there will be a paper open for discussion, read by Joseph Sterling.

The educational session was conducted by Dr. Walter Meyer, who after giving a brief talk, turned the meeting over to George Wagstaff, who read a very interesting and well composed paper on "Plating of Aluminum", after which the group asked questions that were answered by Mr. Wagstaff.

A motion was made and seconded to adjourn. WILLIAM H. FLAHERTY, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch of the American Electroplaters' Society was held at the Hotel Douglas on Friday evening, March 3rd, 1939.

The meeting was called to order by our president, Mr. John Kotches, at 8:40 p.m., with 42 members present.

The applications of Mr. Howard Sievering and Mr. Irving McCaffery were received and ordered to take the regular course.

Under reports of committees, President Liguori of the New York Branch and chairman of the Joint Newark and New York Banquet Committee gave a tentative report, and wished to thank those members of Newark Branch, who acted on the committee, for their help and co-operation. President Kotches replied to President Liguori's remarks, and hoped that the good feeling which exists between the New York and Newark Branches would continue for years to come.

Communications were received by our president, Mr. John Kotches, in regard to the combined New England Educational Session and Banquet to be held in Hartford, Conn., April 15th, 1939. If we could get a group of 20 persons the bus fare would amount to $3.00 per person. The following signified their intentions of going: Messrs. Paul Oldam, Jack Shamis, John Kotches, Thomas Haddow.

Under reading of papers and discussion, Mr. Paul Oldam, librarian of Newark Branch, introduced as the speaker of the evening, Mr. Franklyn J. MacStoker, secretary of the New York Branch. His subject was "Electro Deposits on Glass Reflectors and Mirrors". Mr. MacStoker gave the members of Newark Branch an exceptionally fine talk, fully describing the process which included the cleaning of the glass reflectors, precipitating the silver on the reflectors, silver plating, copper plating and nickel plating. The formula of each was included in the description of each operation. Mr. MacStoker was given a rising vote of thanks for his splendid talk.

Mr. Paul Oldam spoke to the members, as chairman of the Platers' Exhibits committee of the coming convention at Asbury Park, N. J., urging each member to plate something so that Newark Branch would have the best display of plated articles at the convention in Asbury Park.

Meeting adjourned 10:35 p.m.

GEORGE REUTER, *Sec. pro tem.*

ROCHESTER BRANCH

The Rochester Branch held its regular monthly meeting on Friday night, March 24, at the Seneca Hotel. Meet-

ing called to order by Pres. Del Rosso. Minutes of previous meetings read and approved as read. Communications read. Comments. Mr. Berghold then made a report on the progress of the committee in charge of the plated ware exhibit for the National Convention and reported there is to be a display from Rochester. Bills were then read and ordered paid. Mr. Frank Dougherty, chairman of our educational committee reported that we were to have Dr. C. J. Wernlund of the E. I. du Pont Co. as guest speaker at our April meeting. The application of Mr. John Quinn Adams, 751 Jefferson Ave., Rochester, N. Y., for an associate membership was read and he was duly elected. The application of Mr. Ralph H. Walker for an associate membership was then read and ordered published. The memberships of Mr. Harry Sanford, Kenmore, N. Y., and Mr. Wallace A. Keefe, Jamestown, N. Y., were then ordered suspended.

The president then opened the meeting to a general discussion and believe me our live wire educational chairman sure started a discussion. The discussion was on the subject of strips and sure waxed strong and hardy. This went on for quite some time and then the meeting was adjourned.

JUDSON R. ELSTER, *Sec.*

ST. LOUIS BRANCH

Regular meeting of the St. Louis Branch A.E.S. was held Friday, March 10, 1939. Dinner was served at 6:15 p.m. at Central Y.M.C.A.

Roll call of officers showed one absent.

Minutes of previous meeting were read and approved. Letter was read from Mr. Goodsell thanking all for the co-operation shown in the recent membership drive.

Letter was also read from the Milwaukee Branch in regards to resolution to be brought up at the Newark Convention.

Under the next order of business, applications for membership. Five names were read. These were turned over to the Board of Managers to be acted on. Hope to have them elected at next meeting. Following are the names of applicants: Wilson J. Scharr, 2822 LaSalle St.; Charles R. Hamm, 2822 LaSalle St.; Charles J. Simon, 1025 Forest Park Ave.; John T. Moran, 3932-A Palm St.; Clark H. Pinkerton, 2822 LaSalle St. (All Associate members.)

This shows that the membership committee is still on the job.

On the report of the committee, Mr. Musick made few remarks in regard to membership and urged all to get ready for the Convention, as the rates were

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cheap and would like to see about 20 attend from St. Louis.

No further business, meeting was turned over to Librarian J. Vogt, who apologized for not having the meeting at Knapp Monarch, as some unforeseen difficult arose, and then in turn introduced Mr. Pine of Harshaw Chemical Co., who gave a talk on "Bright Nickel". He stated that there was a big field in that line and had some samples which were passed among the members, and spoke some on cleaning, and next he was showered with questions. Mr. Pine answered them and explained each one as only an expert can.

The meeting was very well attended by 40 members, 30 for dinner. Keep up the good work!

St. Louis then gave Mr. Pine a rising vote of thanks for his most interesting and educational talk, hope to have him with us again.

The next meeting to be held the first Friday in April.

C. T. McGINLEY, *Sec.*

MONTREAL BRANCH

The members of the Montreal Branch met on Thursday, February 23rd at 6 p.m. at the New Carlton Hotel. Following the program inaugurated in the fall of last year, the members took supper together. When the suggestion was first made that the monthly meetings be started at 6 p.m., with a supper, each member paying for whatever he ordered, several of the members, the writer included, were far from confident of the results. In this we were wrong, the suppers have been a huge success and the attendance this year to date, has been better than for some years past. The bachelors and the older married men turn up 100%, the more newly married men cannot be quite relied on. Maybe time will tell. In any case acknowledgment is due to Mr. John H. Feeley who proposed the idea and to those who supported his motion. If any other branch of the society is looking for a method to increase attendance at meetings, this secretary would be glad to give further details. As John Feeley said to the waiter "Keep those bread baskets full, this is not a bunch of office workers, but men who have put in eight to ten hours in factory plating rooms, and they are hungry." But the fun was fast and furious. Arthur Willis, who runs wire through his automatic zinc plating tanks at thousands of feet a minute can handle the rolls on the same principle.

We were all glad to have with us Messrs. Eugene Feeley and John T. Risenburg, both of whom return to the fold after some years of absence,

the former as an active and the latter, who sells us Lea Products, as an associate member.

A short business session followed the supper, after which, due to the absence of both our president and vice president through illness, Mr. John H. Feeley was elected to the chair. After a few well chosen words regarding matters of interest to the members, Mr. Feeley turned the meeting over to Mr. Jordan of the Canadian Marconi Company, who undertook to answer to the best of his ability any questions that the members had to ask. These ranged from "What is pewter, and how best to imitate it on brass, to the requirements for hard chromium deposition. Pewter, Mr. Jordan explained was an alloy having tin as its chief constituent, the other being a variety of metals, usually copper. Mr. Laraviere, an expert on this imitation stuff, explained that it was a matter of finding out just what the customer called pewter and then acting accordingly. Sometimes cadmium filled the order, at others, nickel, both on a brushed surface. You pay your money and you take your choice. John Risenberg talked on the copper plating of silvered mirrors as a surer protection for the delicate silver, using first an almost neutral copper sulfate solution followed by a more acid solution.

We have enjoyed meetings where an expert has talked to us on some special subject, we have also enjoyed meetings where a single subject has been selected for exclusive discussion, but if you want to see the chairman sweat give the members free reign to ask any question that they wish and then watch the fun.

JOHN T. CRONIN, *Sec.-Treas.*

GRAND RAPIDS BRANCH

The regular meeting of the Grand Rapids Branch of the American Electroplaters' Society was held March 9, 1939, in the Spanish room of the Rowe Hotel. A good attendance was enjoyed especially considering that quite a few of the members are down with the flu. We were pleased to have with us, as a guest, a member of the Toledo Branch, Mr. Alden.

The following new members were elected: Mr. Hugh Brown, Mr. S. Martin.

Reversing our decision not to exhibit at the coming International Convention, it was decided, after a talk by one of our members, Mr. Chester W. Smith, that the Grand Rapids Branch should be represented. As evidence of the members' enthusiasm after Mr. Smith's comments, he was appointed chairman of the Exhibits Committee. He expressed his willingness to take on the task and most of the members agreed to co-operate.

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The committees gave their reports on arrangements for our coming annual party to be held April 21st, 1939. There will be refreshments, entertainment, and dancing to 1 a.m. Our parties have become very popular and all the members took tickets to sell. An attendance of around 100 couples is expected.

Mr. C. W. Smith, a Grand Rapids Branch member, connected with the J. C. Miller Co., supplier of this city. gave a very excellent paper on "Purification and Filtration of Plating Solutions". His paper, illustrated with slides, dealt with the treatment of most of the plating solutions now in use and gave information not included in other papers that have been given.

CHAS. S. WHALLEY, *Sec.-Treas.*

BINGHAMTON-SYRACUSE BRANCH

The Binghamton-Syracuse Branch held its monthly meeting February 24th at Cortland, New York, with a splendid attendance in spite of the very bad condition of the roads around that section. This branch has a membership scattered over a wide area and it is gratifying to be able to get together 25 or 30 in the middle of winter.

We had as our speaker Mr. O. J. Sizelove who is well known to all our branches from coast to coast. He had as his topic, "The Cleaning of Metals Preparatory to Finishing". He pointed out the impossibility of standardizing on any cleaners for a particular job due in part to the complexities of the organics or inorganics that have to be removed.

The general discussion after Mr. Sizelove's talk seemed to bring out very forcibly the all-important part cleaning has to the finished product. This branch wishes to thank Mr. Sizelove for his attendance at this meeting.

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1.9—3.4 (copper, nickel)	(brass, copper,
0.9—1.5 (copper,	silver)
etc.)	11.0—13.5
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We also had a distinguished member of the Supreme Society with us, Mr. Wm. Kennedy, the executive secretary.

Mr. Kennedy gave us some very much needed words of wisdom at the opening of our meeting and it is hoped they will be heeded. He also spoke at some length on the coming convention and we all felt that Bill is at least as good as Grover Whalen.

The meeting was adjourned about 11:00 p.m., and it was hoped that our next meeting in March will be as well attended.

GEORGE SIMMONS, *Sec.*

LOS ANGELES BRANCH

The Los Angeles Branch of the A.E.S. met Wednesday evening, March 8th at the Rosslyn Hotel with President Earl Coffin presiding.

Minutes and financial report of the

previous meeting were read and accepted.

Mr. M. D. Rynkofs, chairman of the Research Committee, reported that the exposure test panel was nearly complete. Much discussion took place regarding the merits of an instrument for measuring the thickness of plated coatings.

The following was found in the question box:

Q. What is a practical way of racking or connecting flexible tubing to the cathode rod, work to be chrome plated?

A. Use split steel tubing which can be forced inside flexible tube.

Meeting adjourned at 11 p.m.

RAYMOND SOLIVAN, *Sec'y-Treas.*

ANDERSON BRANCH

The Anderson Branch of the A.E.S. held their monthly dinner meeting Tuesday, March 7, at 6:30 p.m., at the Y.M.C.A. President L. R. Hinsch presided.

Mr. W. M. Phillips, national president of the A.E.S. was the speaker. He presented the life story of the 1939 Cadillac die-cast radiator grille. He supplemented his talk with technicolor lantern slides and motion pictures. The motion picture showed the development of the grille in the Arts and Colors Division of the General Motors Corporation and its production processing at the Cadillac plant. The process included the die-casting operation, trimming, polishing, copper, nickel and chrome plating and the finished grille on the car. His talk was very interesting and instructive.

Meeting adjourned at 9:00 p m.

E. T. MCKINNEY, *Sec'y-Treas.*

PROVIDENCE-ATTLEBORO BRANCH

On Monday, March 6, 1939 the Branch attended a meeting at the R. I. School of Design, sponsored by the Engineering Society.

"The History of Metal-Coloring was the topic and, Mr. Geo. B. Hogaboom was the speaker.

George had stated that there were over 300 samples of metal coloring in his display and we did not doubt his word when we saw the display. He had about everything one could imagine and, in his talk he referred back to the time of the Egyptian Dynasty, to show that there was some Metal-coloring being practiced at that time.

On Monday, March 20, 1939 the regular meeting of the branch was held in room 519, Narragansett Hotel. Mr.

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Mark Weisberg delivered a very comprehensive and practical talk on "Rhodium Plating". He gave a review of the several different discoveries and improvements, leading up to the present day Rhodium Plating and also explained how some firms had worked out a way of getting satisfactory results at considerable less cost for Rhodium.

The Vice President was in the chair and thanked Mr. Weisberg for his talk. He also appointed Messrs Weisberg, Don Wood, A. Mankowich to represent the branch on the Research Committee.

There were 4 new members elected.

JOHN ANDREWS, *Sec.*

NEW HAVEN BRANCH

The business meeting of the New Haven Branch was held Tuesday, March 14, 1939, at the Sterling Chem. Lab., with some 30 members present. The meeting opened at 8:25 p.m., with President Joe Downes in the chair. The roll call of officers was read. There were no communications. Bills against the Branch were read and voted paid.

George Knecht, reporting for the exhibit committee, announced that he had some 30 contributors signed up, but was anxious to get more.

It was moved, seconded, and unanimously passed that the treasurer should send a check for $25 to George Knecht to cover any expenses incurred in the preparation of the exhibit.

A second motion was made and passed that the exhibit be insured for the trip to and from Asbury Park.

The meeting was then turned over to Tom Chamberlain, chairman of the Educational Committee, who announced the following speakers for the open meetings for the remainder of this season: April 4, W. G. Sheane, "Paint Utilization", G. E. Co., Bridgeport; May 2, Oliver Sizelove, "Cleaning of Metal Preparatory to Metal Finish", Frederick Gumm Chemical Co., Inc.; June 6, E. A. Anderson, "Zinc Die Casting", New Jersey Zinc Co.

Following this Tom conducted a question box, which proved to be very interesting.

The meeting adjourned at 10-02 p.m. and the members went to the Aschenbroedel Co., and did some work with their chief chemist.

JOSEPH SULLIVAN, *Sec.-Treas.*

BUFFALO BRANCH

The March meeting of the Buffalo Branch was held on the seventeenth with Pres. Joe Ruff in the chair. In the absence of the Secretary, Mr. Hart,

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Dr. Wernlund read the minutes of the last meeting. Mr. Joe Post, chairman of the membership committee, reported on the problem of how to get the members to join in the activities of the Branch and suggested that each member offer to present a paper, and that all should join in the discussions. This idea was well received. Heres hoping some local papers get on our program.

Mr. E. A. Anderson of The New Jersey Zinc Co. was then introduced and gave a very interesting and instructive paper on the plating of Zinc die castings, in which he pointed out that the major cause of blistering in service is now believed to be overcleaning, particularly in the alkaline electric cleaner. With thorough degreasing, preferably in trichlorethylene, only an exceedingly thin film remains to be removed in the alkali. Thereafter a suitable dilute acid pickle (preferably 20 to 30 seconds in 1% HC1 or in 1% HF) completes the cleaning.

Care should also be used to keep the cleaned parts from drying before plating since this results in deposition of an insoluble film, which is almost sure to cause poor adherence of the copper plate.

Care should also be exercised in balancing the alkaline and acid cleaning treatments,—the longer the alkaline treatment the longer the time needed to satisfactory pickle.

An interesting feature of the evenings discussion was the remarks of Mr. Ruff who told how he had succeeded in reducing rejections due to poor plate to less than 1/2% by the use of a very mild hot alkaline dip treatment followed by a 1% HC1 pickle, copper strike, High Speed cyanide copper plate, Bright nickel, and chrome. This is very gratifying when it is realized that Joe puts thru 50,000 to 75,000 parts per day.

Following a lively discussion, the meeting adjourned at 10:45 P. M., with a rising vote of thanks to Mr. Anderson for his instructive and interesting lecture.

C. J. WERNLUND

CLEVELAND BRANCH

The regular monthly meeting of the Cleveland Branch of the A.E.S. was held Sat., March 4, 1939. Meeting called to order by our Vice President Mr. Carlson, due to hoarseness of our Pres. Mr. Matts.

The minutes were approved as read.

Applications of Mr. Edward P. Riley, of the Thompson Products, Inc. of Cleveland, Ohio, associate; Mr. Gilbert Tramer of J. J. Siefin Co. of Detroit, Mich, associate, were read.

There was no election, due to the

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open meeting. Committees report progress. Cleveland Branch in favor of Milwaukee resolution. Meeting turned over to our librarian.

Mr. Sizelove of the Frederick Gumm Chemical Co. gave a very interesting talk on "Metal Cleaning". After his talk Mr. Sizelove answered questions on plating and cleaning.

Mr. Sizelove was given a rising vote of thanks and the Cleveland Branch thanks the Frederick Gumm Chemical Co., who made it possible to have Mr. Sizelove give this talk.

Meeting adjourned 10:00.

CHARLES F. OTT, *Sec.*

SPRINGFIELD BRANCH

The regular monthly meeting of the Springfield Branch was held at the Hotel Charles on Monday, March 27th at 8:00 P.M.

The meeting was called to order by the President, Mr. J. Costigan. A communication from Mr. E. A. Anderson, A.E.S. representative for the American Co-ordinating Committee on Corrosion was read. Because none of the Branch members are engaged in studying corrosive no one was appointed to assist the committee. Mr. Costigan, chairman of the publicity committee for the regional New England convention, explained the arrangements which have been made for the convention and urged every member to attend.

The following members were appointed to serve on the nominating committee: Messrs. Seidel, Clark, and Hastie. They will present their nominations at the coming meeting.

The following applications for membership were received: Mr. Edmont T. Manley, The Chemical Corporation, Associate, and Mr. Walter Czepiel, Hampton Specialty Products Co., Associate.

Mr. Kennedy introduced Mr. E. Rinker of Oakite Products Co., who described the methods used for electroplating novelty jewelry. Mr. Rinker explained that cold rolled steel is preferable for novelty jewelry because of its low cost, strength and light weight. The work is racked on phosphorus bronze clips and bronze plated .0003 in. thick. Bronze is used because it is smooth, hard, and easy to buff. It is a good lubricant for the dies, possesses excellent corrosion resisting qualities and will stand the annealing temperatures and hard soldering. After

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the fabrication is completed the parts are bright nickel plated prior to the finish plate in a solution with low brightner content, low current density and temperature, minimum agitation and high pH. The tanks are usually heated above the operating range at night so that they will be clear and up to temperature in the morning. One of the following methods is usually employed in drying the plated work: Rinse in cold then hot water, which contains a weak soap solution, rinse again in hot water and dry in sawdust. 2. Rinse in cold then hot water, dip in alcohol, rinse and dry in sawdust. Rinse, reverse current in alkaline solution at 10 to 20 amps. per sq. ft. for 1 to 2 min., using nickel anodes, rinse in dichromate solution, rinse in hot water and dry. All articles are given three coats of lacquer.

At the conclusion of his talk Mr. Rinker answered the following questions:

Q. How much rhodium is usually deposited on novelty jewelry?

A. From 2 to 5 mils.

Q. Do the jewelry platers buff their steel?

A. No, they use prefinished steel.

Q. What kind of lacquers are used for jewelry?

A. Nitroceluose lacquers are most popular.

Q. What is the best procedure to use in refinishing gold rings?

A. Scrub with soap and ammonia, rinse, electro clean cathodically, rinse and gold plate.

Mr. Rinker's talk was thoroughly enjoyed and he was given a rising vote of thanks.

The meeting was adjourned at 10:30.

D. S. HARTSHORN, JR., *Sec.-Treas.*

CINCINNATI BRANCH

The regular meeting of the Cincinnati Branch of Mar. 23rd was an interesting one from several angles; one, having an attendance of the majority of its members, which was enlarged by the election of 3 associate members, and the company of 8 visitors, some of whom we regard as prospective members, judging by their apparent interest displayed in matters for discussion.

The communications from the Milwaukee Branch, and the Plated Ware Exhibits Committee, were presented for advisement for future action.

Our Librarian then read a paper, his composition, on the "Decomposition of Cyanide in a Cyanide Plating Bath".

This paper proved very interesting and kept the speaker busy for some time after its delivery, to answer questions pertaining to same, and our sincere thanks expressed, followed.

Two lonely questions out of the Question Box, go out from the Cincinnati Branch meeting unanswered, to which answers are requested through the medium, Branch News, or direct to the secretary of the Cincinnati Branch, from the general membership, which would be appreciated.

Q. Is chromium plating done successfully in a plating barrel anywhere in the States?

Q. Does perforating a flat 6% antimonial lead anode give it added conductance?

JOS. ALDER, *Sec.*

BOSTON BRANCH

Boston Branch met Thursday, April 6th at the Bradford Hotel, Boston, with Pres. DeLorme in the chair.

Minutes of the previous meeting read and approved; communications read and placed on file; bills read and moved they be paid.

One application was read for the first time and turned over to the board of managers: Cyril W. Winders, 121 Hale Street, Bridgewater, Mass., associate.

One application read for the second time and elected to membership: Robert Magnuson, 46 Roberts Street, Malden, Mass., associate.

The chairman of the banquet committee not being present the secretary made a report on the banquet of March 4th; it was one of the best the Branch ever held. It is hoped that a final report can be made in the next month.

Boston Branch expects to make a good showing at the Hartford banquet. Our President, Edward C. DeLorme, will represent Boston Branch.

After the regular order of business the chair was turned over to the Librarian, Arthur Mintie. He gave a talk that interested all the members present. Subject of his talk, "General Discussion of Replenishing or Building Up of Solutions". He drew the chart of the pH on the blackboard. Some of the members had never seen this before, and also showed how to take the pH of solutions having the test sets with him. He finished up with showing how normal solutions are made and then spoke of specific gravity of different metals. A general discussion was on after Arthur got through that lasted for an hour. A vote of thanks was given him for his interesting talk.

Meeting adjourned at 10:30 P.M.

A. W. GARRETT, *Sec.*

NEW YORK BRANCH

The New York Branch held two regular meetings during the month of March.

The first meeting of Friday, March 10th, was an Educational meeting, presided over by Dr. C. B. F. Young, the Branch Librarian, and featured by a talk by Mr. Wm. J. Schneider, a long time member of our Branch, of the E. I. duPont de Nemours Company. Mr. Schneider's subject was "Modern Developments in High Speed Copper Plating", a topic of current interest among the platers and chemists. Mr. Schneider has spoken before our Branch on several occasions but at no time did he create the interest shown at the March 10th meeting. He covered his subject well and answered many pertinent questions during the after-discussion. There were sixty-five members present and they gave "Cyanide Bill" a real standing vote of thanks and appreciation for his effort of the evening.

The second meeting of Friday, March 24th, was a business meeting, followed by a discussion and prepar-

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ation of the New York Branch Paper that is to be presented at the coming Convention, and a Question Box period of a half hour.

There were several applications for membership presented at these meetings.

The meetings were adjourned at 11:00 and 10:45 P. M. respectively.

F. J. MACSTOCKER, *Sec.*

BINGHAMTON - SYRACUSE BRANCH

The March meeting of the Binghamton-Syracuse Branch was held at the Cortland Hotel, Cortland, New York, Friday, March 31.

This meeting had the best attendance of any so far this season, about forty being on hand to hear the very able Mr. Wm. Schneider of the du Pont Corporation give his talk on "High Speed Copper Plating". Mr. Schneider handles his subject in a very interesting and practical manner and it is certain everyone at this meeting went away with a more thorough knowledge of copper plating.

It does seem incredible to some of us old time platers that deposits of .015" of copper can be deposited in a barrel, but samples were there to prove it.

Plenty of discussion followed Mr. Schneider's talk and he very capably took care of every question. The evening was voted one of the best we have had.

We also had with us Past Supreme President of the A.E.S. Frank Mesle who was most certainly mistaken for someone else by our Olean member, John Vitale, (tut, tut, John). Hope to see more of both of them at our meetings.

Meeting was adjourned at 11 P.M.

GEORGE SIMMONS, *Sec.*

ANDERSON BRANCH

The regular monthly dinner meeting of the Anderson Branch of the A.E.S. was called to order by President L. R. Hinsch at 7:30 o'clock, Monday, April 3, at the local Y.M.C.A. The meeting was preceded by a dinner which began at 6:30 P.M.

Mr. B. G. Daw, President of the Lasalco Company, Inc., St. Louis, Missouri, was the speaker of the evening. His subject was a "Practical Demonstration of What Happens in a Plating Barrel". He had a plating barrel with a glass side in it, in order to show very clearly the effect of size of work and speed of rotation. The program was very well received and a lengthy discussion developed over the theory of ball burnishing.

The meeting adjourned at 9:30 P.M.

E. L. MCKINNEY, *Sec.-Treas.*

TORONTO BRANCH

March 27, King Edward Hotel, in room G, President Acheson opened the meeting with 34 members including Mr. Mundy and his Hamilton gang, with Jim Graham acting as secretary in the absence of Harry Hands. Bills were handed to the trustees, and Tom O'Keefe gave a report of the card and luncheon party which turned out a very successful and splendid affair, with the attendance of 95, lots to eat and 31 prizes donated by the platers and their employers which in value far exceeded the expenses of the evening. Harry Hands and Fred Bing were reported as being on the mend and are expected back to work shortly.

Good and welfare were next on the list.

The president called on vice chairman Archie Smith to give the first demonstration on the study of plating racks. 21 racks were on display for the

members' inspection. All shapes and designs, with metals of copper, brass, phosphor bronze and steel. Racks made of duraluminum, bronze clips and springs. Mr. Smith said in thinking of racks, brought out ideas of better ones, and that racks should not be made out of scrap, but of good material, riveted and welded, because they were not for sale, being created for a two-fold purpose; that of enabling the plater to do good work and also to do it cheaply. One of the racks belonging to Mr. Smith cost fifteen dollars, and was used for the aluminum anodizing process.

Harry Bird was next with racks for toilet sets; showing racks made in the breaker style, two of them lacquer insulated and getting good results, Tom O'Keefe was next with racks for zinc die castings showing candlesticks, salt and pepper shakers, etc. All silver plated. The racks were insulated except the tips of the prongs. The racks were well made and hung in the tank with the articles offset on a 45 degree angle.

Charlie Kemish demonstrated with brass racks for silverware with bronze springs and insulated. Colin Turner produced a rack that was rather unique. This rack was made to hold screws for plumber sanitary supply, and consisted of a centre rod with coil spring made of bronze all the length of the rod and stretched on a board, making it easy to load one gross of screws. When spring is released, the tension holds screws tight, and when spring is stretched again the rack is emptied. Mr. Turner was complimented.

Jack McLean was next with a few light steel and brass racks for cycle parts and very well made. A rack for wheel hubs with spring system was well thought out.

This was a very interesting meeting and well worth while. It is rather peculiar however, after all those years, and with modern rheostats at our disposal, that platers still talk about breakers and dummies.

Meeting adjourned 10:20.

J. S. CAIRNS, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S., was held on Friday evening March 17, 1939, at the club room of the Hotel Douglas, Newark, N. J. The meeting was called to order at 8:30 P.M. with president John Kotches presiding. All other officers were present.

The meeting of the previous meeting were read and approved.

A communication from the Milwaukee Branch with reference to an amendment to the constitution, was read and it was voted to leave this matter to the discretion of the delegates at the Convention.

A communication from Mr. Charles H. Proctor was read and placed on file.

A communication from the American Co-ordinating Committee on Corrosion was read and it was decided to hold same over for discussion at the next meeting.

Applications for Mr. Urban A. Mullin and Mr. Edmund T. Piotrowski to associate membership were received and voted to take the regular course.

Under reports of committees Mr. Horace Smith reported that the Convention Committee had given up the idea of an exhibit at Asbury Park due to the lack of co-operation on the part of the majority of the supply houses.

Mr. George Wagner reported that the final report of the Newark-New York joint banquet would be ready for the next meeting.

Mr. Paul Oldam again urged the members to prepare articles for our plated ware exhibit which he hopes will be larger than that of any other convention. He then presented the guest speaker of the evening, Mr. R. O. Hull of E. I. du Pont de Nemours Co., who gave us a wonderful talk on "Bright Copper and Bright Cadmium". He exhibited numerous samples which had been plated in both high speed bright copper and bright cadmium solutions. He also presented numerous slides on which he showed the formulas of different types of copper and cadmium solutions and the characteristics of addition agents in these solutions. Mr. Hull was given a rising vote of thanks by the 96 members present. Meeting adjourned at 11 P.M.

GEORGE WAGNER, *Sec.*

PHILADELPHIA BRANCH

Philadelphia Branch meeting called to order by Pres. Joe E. Underwood presiding. Librarian E. J. Zurbach, Jr., introduced Dr. Meyer who delivered an illustrated lecture on the "Filtration of Plating Solutions", ably assisted by Messrs. Helbig and Langdon. After a brief discussion, it was moved and seconded that the speakers be given a rising vote of thanks.

Mr. Antisell, member of Philadelphia Branch was then introduced to the members as he had travelled from Pittsburgh to hear the lecture and pay us a visit.

Applications of Messrs. Maurice Kraft and Jack Scalise for active membership referred to Board of Managers. Applications of Messrs. J. W. Bardsley, associate member, and Cyril Wharrad, Carl Doerr, active members, reported favorably by Board of Managers. Moved and seconded applicants be elected to their respective classification. Carried.

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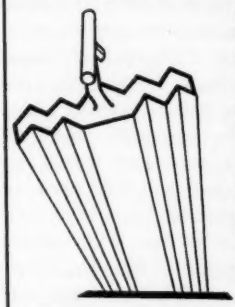

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Communication from Milwaukee Branch read, moved and seconded same be laid over until next meeting. Carried. Communication from American Co-ordinating Committee on Corrosion read, moved and seconded same received and filed. Carried. A communication from Mr. Oldham read; moved and seconded be laid over. Carried.

It was moved and seconded a committee be appointed to investigate the feasibility of entertaining the visitors to Philadelphia on Saturday and part of Sunday, before the International Convention. Carried. The committee appointed was as follows: A. M. Robson, E. J. Zurbach, A. T. Harris, and F. Fulforth. Sec, Robert E. Jackson, Jr., informed the members that Mr. Harry Snyder is under the doctor's care; moved and seconded secretary-

treasurer be reimbursed for purchase of basket of fruit for Mr. Snyder; the members were asked to send Harry a "get well" card. The secretary notified the Branch that Mr. J. Mahaffy had lost his beloved wife.

Mr. Critchfield informed the members present of the work done at the new electro-platers' class at Lancaster, with a membership of 45; also the fact that 8 of that class were present at this meeting. The Philadelphia Branch class at the Jules Mastbaum Vocational Training School evening classes under the supervision of Mr. Al Hirsch, concluded their year's work with a very good showing, and will hold their annual class dinner at "Smith's", 15th and Spring Garden Sts., Philadelphia, Penna., April 6th at 7:00. Dr. Owens of the Board of Education and Mr. Wesp, principal of the school will be present.

Members take note. The new by-laws require that the Branch secretaries send the list of members of their Branch in good standing before the end of fiscal year, April 30, 1939, in order to receive their report of the coming Convention. The next meeting will be very important as it will be nominations of officers. April 28, 1939, at Harrison Lab., University of Pennsylvania, 34th and Spruce Sts., Philadelphia, Penna., 8:00 P.M.

ROBERT E. JACKSON, JR., *Sec.-Treas.*

MILWAUKEE BRANCH

The Milwaukee Branch of the A.E.S. held its regular meeting on Thursday, April 6th, at the Republican Hotel.

The meeting was called to order by President Dexter Rhodes. Minutes of the previous meeting were read and approved of. All communications were read and ordered to be placed on file. The application of Clifford Jung was also read and it was moved that it take its regular course.

The Banquet Committee reported that everything is in readiness for the Educational & Banquet on Saturday, April 29th, to be held at the Schroeder Hotel. We assure all attending a good time, and an interesting Educational Session.

The Board of Managers reported the death of a new member, Walter Geil, who was associated with the Reliable Plating Company of Milwaukee, Mr. Geil joined the Society in January, 1938, and in that short time he made many friends, who will miss him greatly. The sympathy of the Milwaukee Branch, A.E.S., is extended to Mrs. Geil.

Nominations of officers for the coming year was held with the following results:—President Rodney, Olsen; Vice President, William Geissman and Robert Steuernagel, Jr.; Sec.-Treas, Robert B. Goodsell; Librarian, Henry Bornitzke. Board of Managers, Dan Wittig, Robert Steuernagel; Jack Geissman. Delegates for the Convention. R. M. Goodsell; Rodeny Olsen, Dan Wittig; Robert Steuernagel. Alternates, Roman Binder; Harry Unke; Robert B. Goodsell.

Mr. A. J. Hermansen of Globe Union, Inc. of Milwaukee, gave an interesting talk on "Costs in Fabrications."

The meeting adjourned at 10 P. M.

ROBERT B. GOODSELL, *Sec.*

DETROIT BRANCH

Minutes of April 7, 1939, Meeting.

J. W. Higgins presiding, with an atendance of 130 men. Minutes of March 3rd meeting were read and approved.

There were 15 new applications for membership, which were referred to the Board of Managers.

There were 35 new members on which the Board of Managers reported favorably, and they were unanimously elected to membership. There was one reinstatement to active membership. There were three resignations accepted.

Mr. Burton G. Daw, President of LaSalco, Inc., St. Louis, Mo., was then introduced. His subject, "What Happens in a Plating Barrel" with practical demonstration was indeed quite practical. It left nothing to the imagination, and everyone present must have seen the practicality of it. There was quite some discussion brought out in the questions asked him after his demonstration. He had no paper, just simple demonstration of what happens in a plating barrel, with it operating before the audience.

Mr. Lewis then passed the question box and found quite a few questions in it. These were all answered to the satisfaction of all present. These questions and answers will be published in our next issue of the REVIEW.

Meeting adjourned at 10:00 P. M., to a well prepared buffet lunch in the same room, and everyone had all they could eat and drink, and a real good time was enjoyed by all until after midnight.

Nomination, election and installation of officers will be at our May 5th meeting, as well as election of three delegates and three alternate delegates to the convention at Asbury Park, June 19-22.

T. C. EICHSTAEDT, *Sec.-Treas.*

CLEVELAND BRANCH

The regular monthly meeting of the Cleveland Branch of the A.E.S., was held Saturday, April 1, 1939 at 8:30 at the Hotel Cleveland.

Meeting called to order by our President, Mr. Matts. Minutes were approved as read. There were no applications.

Eleven new members were elected to the Cleveland Branch. Committee reported Progress.

Our annual picnic will be held July, 15 or 22.

The Cleveland Branch elected Mr. Fred Matts, second term as President. Mr. Fred Carlson second term as Vice President, Mr. P. R. Lyons, Sec. and Treas., Mr. Frank Truden, second term as Librarian; Board of Managers, Mr. J. C. Singler, Mr. Wm. O'Berg, Mr. Steen Thompson; Delegates to Convention, Mr. F. Matts; Mr. Wm. Scott; Mr. Wm. O'Berg. Alternates, Mr. C. Ott; Mr. F. Truden; Mr. F. Carlson.

At our next meeting Mr. Steen Thompson will install new officers.

Meeting adjourned at 10:00.

CHAS. F. OTT, *Sec.*

CHICAGO BRANCH

The regular monthly meeting of the Chicago Branch was held on April 15, 1939, at the Atlantic Hotel. President J. W. Hanlon, presiding. Communications read and acted upon.

Applications of Mr. R. Nickolson, Mr. A. Odette and Mr. J. Trezek were elected to membership.

Mr. C. Clindinin reported on the Exhibit and membership committees. Mr. F. J. Hanlon reported that the Los Angeles' Branch Educational session and Banquet was a grand affair lasting from 9:00 A. M. until the next day. Mr. R. Goodsell of Milwaukee Branch had a few words to say and invited the members to the Milwaukee Educational session and Banquet on April 29th.

Mr. R. J. Hazucha and Mr. C. S. Tompkins were appointed as tellers and Mr. C. Kocour as Judge for the election of officers.

Mr. W. J. Hanlon was elected President, Mr. E. Lanz, Vice President; Mr. M. H. Longfield, Secretary-Treasurer; Mr. O. Weickmann Librarian, Mr. Clyde Kelly, Mr. J. Brydan, Mr. W. Erskine to the Board of Managers; Mr. J. W. Hanlon, Mr. H. A. Gilbertson; Mr. F. J. Hanlon as Delegates, Mr. O. E. Servis, Mr. M. N. Longfield; Mr. W. J. Erskine as alternates. Mr. C. S. Tompkins was appointed as Publicity man for the trade Journals. Mr. J. Mintz was appointed as Sargent-at Arms.

The following question was found in the question box.

Q. Where can copies of the Proceedings of the Electrodepositors Technical Society be read?

A. At the Newburry Library in Chicago.

M. H. LONGFIELD, *Sec.-Treas.*

BRIDGEPORT BRANCH

The regular Monthly and Annual Meeting of the Bridgeport Branch was held in the Chamber of Commerce Rooms at the Stratfield Hotel on Thursday, April 6 at eight o'clock. Joseph Sterling, Pres. presided. Mr. W. J. R. Kennedy, Executive Secretary was among the guests.

The roll call of officers was read, all were present, except William Thompson of the Board of Managers. The minutes of the last meeting were read and accepted.

Reports of Special Committees: Mr. Kennedy and Dr. Walter Meyer reminded the members of the Regional meeting, Banquet and Educational Session to be held in Hartford, Conn. on April 15 in the Hotel Garde. At the Educational Session, Mr. Edward Charleson will represent the local Branch by presenting a paper.

A communciation on the Educational Session and Banquet to be held by the Milwaukee Branch on April 29 was read. A communciation was also read from Mr. E. Anderson, Representative of American Co-ordinating Committee on Corrosion, this was placed on file.

The following officers for the Branch were elected as well as Delegates and Alternates to the Convention: President, William Ehrencrona; Vice Pres., Edward Charleson; Secretary-Treas., Eugene Phillips; Librarian, Clarence Helmle; Sargent at Arms, Kenneth Schneider; and Board of Managers, William Stratton, William Thompson and Ray O'Connor, re-elected. Delegates to the Convention, Raymond J. O'Connor, of 60 Disbrow Street, Stratford, Conn.; Joseph Sterling, 134 Colony Street, Bridgeport Conn. and William Ehrencrona, Box 275 R.F.D.3 Bridgeport, Conn. Alternates to the Convention; Alex Boggild, Box 63, Trumbull, Conn.; Elmer Monson, 168 Pacific Street, Bridgeport, Conn. and George Wagstaff, R. F. D. 3 Belltown, Stamford, Conn.

An application for associate membership presented by Leo Miller was voted on and turned over to the Board of Managers.

Bills against the Branch were ordered paid.

Good of the order; Remarks were made concerning the attendance of the members at the Convention. Suggestions were made by Mr. Kennedy, Mr. Sterling and Dr. Meyer that the men take notes on valuable information given at the sessions, that they might come back and lend any help to their employers.

Dr. Meyer gave a brief talk preceding the Educational Session, then Mr. Sterling read a very interesting paper on "Nickel Finishing" after which there was a period for questions. This paper will appear in the REVIEW. At the May meeting papers will be

read by Mr. Ehrencrona, Mr. Charleson and Clarence Helmel after which prizes of $15.00 and 10.00 will be awarded to the two people who have presented the best papers during the course of the year.

A motion was made and seconded to adjourn at 10:45.

WILLIAM H. FLAHERTY, *Sec.*

DAYTON BRANCH

The regualr monthly meeting of the Dayton Branch was held at the Dayton Engineers Club on Friday, April 7th.

The minutes of the previous meeting were read and approved.

A letter from Mr. E. A. Anderson of the American Co-ordinating Committee on Corrosion was read by Mr. Conley and the Secretary was instructed to give Mr. Anderson the desired information.

A letter from the Cleveland Branch concerning a regional meeting was put aside for discussion at our May meeting.

Mr. Cochran, Chairman of our exhibits committee has things shaping nicely for our exhibit and he and his associates are doing their best to keep the Metal Industry Cup in Dayton.

Mr. Luechauer introduced our speaker, Mr. Daw, President of the LaSalco Corp. who gave his demonstration of Barrel Plating.

This was done by means of a barrel with glass sides which enabled the audience to study the performance of different loads at different speeds.

Mr. Daw brought out the fact that many barrel platers load their barrels by volume, and demonstrated the fact that although the volume may be the same in two different barrels, the actual surface may vary greatly due to the size and shape of the piece. If these barrels are plated the same length of time under the same conditions, the quality of the plating job on the one with the most surface must be inferior to that of the other.

After seeing this demonstration it seems that a barrel revolving at from 2 - 6 R.P.M., and loaded not over about three-fifths full gives the best results. Plating time and other conditions should be adapted to the actual surface to be plated, and if possible a variable speed barrel would be an advantage, especially where the work varies in size and shape.

At the close of this most interesting demonstration Mr. Daw was given a vote of thanks and our meeting was adjourned until the first Friday in May.

CORLISS W. POWELL, *Sec.*

DETROIT BRANCH QUESTIONS

Q. Why is brass plating preferred over other metals on steel for rubber adhesion?

A. Brass plate was the first electrodeposit to be found satisfactory for this purpose. Further research would doubtless disclose others.

Q. Are curved anodes better than straight anodes for barrel plating?

A. No evidence to indicate any advantage in curved anodes.

Q. How long is it necessary to run steel parts in a nickel barrel to meet 24 hour salt spray specification?

A. Approximately 2½ to 3 hours at high current density.

Q. What factors should be considered to insured parts plated in a barrel meeting specifications?

A. In general, smaller parts have greater area per unit of volume than larger parts. Thus the load should be smaller or the time longer on smaller parts.

Q. How often should copper nickel and chrome solutions be analysed?

A. Nickel, complete analysis weekly, pH daily or oftener. Copper, free cyanide, other constituents weekly. Chrome, weekly.

Q. What is the recommended p H for bright nickel in a barrel?

A. Should be held at the upper limit for good throwing power.

Q. Which is cheaper to produce in a barrel - cadmium or zinc of equal thickness, at current market prices for these metals?

A. Beside the metal cost, the following factors apply:

Greater current consumption for zinc.

Cheaper barrel maintenance for cadmium.

Cooling equipment for zinc.

Cost of brighteners, etc.

WATERBURY BRANCH

The April meeting of the American Electroplaters' Society, of Waterbury Branch, was held Friday, April 14, 1939 at the Hotel Elton.

President Lougee reported on the progress of the exhibit committee and asked that all material for the exhibit be given to him not later than the 10th of May. He also appointed a nominating committee to draw up a slate of officers for the coming year, consisting of William Gray, Tennant Elwin and George Dubpernell.

A subject of considerable interest to members of other branches as well as the Waterbury Branch was the recommendation, which was unanimously passed by acclamation, that Bob Leather be elected an honorary member of the Waterbury Branch. It is felt that this action by the Waterbury Branch partially repays Bob for the multitude of things he has done for them in the last several years.

The speaker of the evening was Dr. Stericker of the Philadelphia Quartz Company who spoke on "Silicate Detergent for Metal Cleaning". Dr. Stericker showed the difference between the action of various alkalies on such easily corrodible metals as Aluminum, and also by means of curves and graphs showed the places in which each of them could be used. After his formal talk was over he answered questions from the floor for a considerable length of time.

E. T. CANDEE, *Sec.*

MR. HOTHERSOLL WILL ATTEND THE CONVENTION. In a letter recently written to Mr. Hogaboom from Woolwich, England, Mr. A. W. Hothersoll, President of the Electrodepositors Technical Society, writes that unless prevented by unforeseen circumstances he will attend the A.E.S. Convention at Asbury Park. We hope it will be possible for this distinguished visitor to be our guest, and assure him that he will find a warm welcome awaiting him on his arrival.

PRESIDENT PHILLIPS SAILS FOR EUROPE. President W. M. Phillips sailed for Europe, Saturday, April 1, on the Normandy. Mr. Phillips will be away approximately two months, but plans to return in time for the Convention in June.

Membership Report

to April 1, 1939

ELECTIONS

Edwin Rossiter Fait, 7 W. Front St., Cincinnati, Ohio
Associate, Cincinnati Branch

Oscar Gast, 2021 Highland Ave., Cincinnati, Ohio
Associate, Cinncinati Branch

Fred W. Vogel, 431 Main St., Cincinnati, Ohio Associate, Cincinnati Branch

A. Mankowich, Y.M.C.A., Mary St., Newport, R. I.
Associate, Providence Attleboro Branch

Frederick E. Allen, Oakite Products, Inc., Providence, R. I.
Associate, Providence-Attleboro Branch

Richard W. Eden, 106 Central Ave., E. Providence, R. I.
Active, Providence-Attleboro Branch

Alfred G. Ouellet, 45 Peck St., No. Attleboro, Mass.
Active, Providence-Attleboro Branch

John Q. Adams, 751 Jefferson Ave., Rochester, N. Y.
Associate, Rochester Branch

Robert Magnuson, 46 Roberts St., Malden, Mass. Associate, Boston Branch

William Swain, Penna. Salt Mfg. Co., 10000 Widener Bldg, Philadelphia, Pa. Associate, Philadelphia Branch

Carl Doerr, 1515 W. Venango St., Philadelphia, Pa.
Active, Philadelphia Branch

Cyril Wharrad, 244 College Road, Erdington, Birmingham, England
Active, Philadelphia Branch

J. W. Bardsley, Hardings (Pendleton) Ltd., Pendleton, Manchester—6, England. Associate, Philadelphia Branch

Leo E. Miller, 80 Floral Way, Stratford, Conn. Associate, Bridgeport Branch

Jesse E. Pitts, Box 193, Van Dyke, Mich. Active, Detroit Branch

Emmet R. Reed, 270 Grove, Highland Park, Mich. Active, Detroit Branch

P. M. Savage, 1106 Republic Bldg., Cleveland, O. Associate, Detroit Branch

Chris J. Schnon, 1014 W. Saginaw St., Lansing, Mich.
Active, Detroit Branch

George O. Sharrock, c/o Motor State Products, So. River St., Ypsilanti, Mich. Active, Detroit Branch

Frank E. Smith, 4320 Toledo Ave., Detroit, Mich. Active, Detroit Branch

Henry Strow, 1651 E. Grand Blvd., Detroit, Mich.
Associate, Detroit Branch

Francis Tresman, 2992 Sheridan, Detroit, Mich. Active, Detroit Branch

Harold J. Wiesner, 448 Park Lane, E. Lansing, Mich.
Associate, Detroit Branch

Harry L. White, 631 Dubois St., Detroit, Mich. Active, Detroit Branch

J. Donald Wieland, 1651 E. Grand Blvd., Detroit, Mich.
Associate, Detroit Branch

R. Burton Wood, 15500 Mendote, Detroit, Mich. Associate, Detroit Branch

Theodore Blay, 6462 Sheridan Ave., Detroit, Mich. Active, Detroit Branch

Steve Bubnar, 2128 Jos. Compau, Detroit, Mich. Associate, Detroit Branch

William R. Conlon, 6044 Woodward Ave., Detroit, Mich.
Associate, Detroit Branch

Theodore G. Coyle, United Chromium, Inc., 2751 E. Jefferson Ave., Detroit, Mich. Associate, Detroit Branch

Lewis F. Davis, 2431 Scotten Ave., Detroit, Mich. Associate, Detroit Branch

Edward J. Finnie, 924 Gilldale Drive, Royal Oak, Mich. Active, Detroit Branch

Ira W. Frost, 86 Hamilton St., Pontiac, Mich. Associate, Detroit Branch

Theodore N. Gassen, 16568 Snowden Ave., Detroit, Mich. Active, Detroit Branch

Neil M. Hyde, 2431 Scotten Ave., Detroit, Mich. Associate, Detroit Branch

Wallace R. Ivers, 653 Dubois St., Detroit, Mich. Active, Detroit Branch

Edgar W. Jones, 15848 Kentucky, Detroit, Mich. Associate, Detroit Branch

Leo J. Keenan, 13042 Camden Ave., Detroit, Mich. Active, Detroit Branch

William E. Lovell, 27014 Koerber, St. Clair Shores, Mich. Active, Detroit Branch

Gerald O. Ludwig, 15538 Indiana, Detroit, Mich. Associate, Detroit Branch

Harold T. Miller, 5846 Frontenac, Detroit, Mich. Active, Detroit Branch

James R. McQueen, 3143 Bellevue, Detroit, Mich. Associate, Detroit Branch

Russell Munch, Packard Motor Car Co., Detroit, Mich. Associate, Detroit Branch

Isadore Nusbaum, 1954 Taylor, Detroit, Mich. Active, Detroit Branch

George M. Aronen, 13645 Mapleridge, Detroit, Mich. Active, Detroit Branch

Arthur D. Barnett, 17260 Gable, Detroit, Mich. Active, Detroit Branch

Hubb Bell, 12850 Woodward, Detroit, Mich. Associate, Detroit Branch

Arthur E. Bergwall, 27729 Bohn Ave., Roseville, Mich. Active, Detroit Branch

Jess Bunch, Cadillac Motor Car Div., Detroit, Mich. Active, Detroit Branch

Joseph W. Manz, 9209 Ada Ave., Chicago, Ill. Associate, Chicago Branch

Joseph Tnezek, 2837 S. Central Pk. Ave., Chicago, Ill. Associate, Chicago Branch

Arthur R. Odette, 540 N. Western Ave., Chicago, Ill. Active, Chicago Branch

Robert J. Nickolson, c/o B. Mercil Plating Co., 1911 Fulton St., Chicago, Ill. Associate, Chicago Branch

Donald H. Schantz, 826 Seventh Ave., Coraopolis, Pa. Associate, Pittsburgh Branch

James H. Connolly, 1230 Hiland Ave., Coraopolis, Pa. Associate, Pittsburgh Branch

James Albert Richardson, 613 Maple Ave., Sewickley, Pa. Associate, Pittsburgh Branch

APPLICATIONS

Alfred G. Ouellet, 45 Peck St., No. Attleboro, Mass.
Active, Providence-Attleboro Branch

Urban A. Mullin, 70 Park Ave., Madison, N. J. Associate, Newark Branch

Edmund T. Piotrowski, 125 Cedar Hill Ave., Belleville, N. J.
Associate, Newark Branch

Walter Klinsevich, Jacques Kreisler Sales Corporation, New York City
Associate, New York Branch

Cyril W. Winders, 121 Hale St., Bridgewater, Mass.
Associate, Boston Branch

Bernard Martin, Box 2277, Brooklyn Station, Cleveland, O.
Asssociate, Cleveland Branch

Gilbert Tramer, 10335 Orville Ave., Cleveland, O.
Associate, Cleveland Branch

Edward P. Riley, c/o Thompson Products Inc., 2196 Clarkwood Rd., Cleveland, O. Associate, Cleveland Branch

John A. Turk, 1106 Republic Bldg., Cleveland, O.
Associate, Cleveland Branch

Virgil H. Waite, McGean Chemical Co., Box 2277, Brooklyn Station, Cleveland, Ohio Associate, Cleveland Branch

O. Glenn Cross, 64 Fourth Ave., Berea, Ohio. Associate, Cleveland Branch

Louis C. Sobey, 6906 Edgepark Drive, Garfield Hts., Cleveland, Ohio
Active, Cleveland Branch

Allen G. Larson, 8 Sheppard Rd., Ashtabula, Ohio
Active, Cleveland Branch

C. Arthur Fullerton, 508 Carroll St., Youngstown, Ohio
Active, Cleveland Branch

Carl H. Shoemaker, 901 Sherwood Ave., Youngstown, Ohio
Active, Cleveland Branch

Frederick T. Buescher, General Supply Co., St. Clair Ave., Cleveland, Ohio Associate, Cleveland Branch

REINSTATEMENTS

Eugen Feeley, c/o John H. Feeley, 1437 Aylmer St., Montreal, Canada
Montreal Branch

John T. Risenbury, c/o Lea Products Co., 686 Notre Dame St., West, Montreal, Canada Montreal Branch

Jos. Oswald, Otis Elevator Co., Yonkers, N. Y. New York Branch

SUSPENSIONS

Harry Sanford, 253 W. Hazeltine, Kenmore, N. Y. Rochester Branch

Wallace A. Keefe, 18 Connecticut Ave., Jamestown, N. Y.
Rochester Branch

John Greig, 39 Alfred Rd., Arlington, Mass. Boston Branch

The Abstract Section

FREDERICK FULFORTH, *Chairman, Program and Educational Committee*

Process of Precipitating Structural Constituents in the Electrolytic Oxidation of Aluminum Alloys and Their Influence on Some of the Properties of the Oxide Layer. By H. RÖHRIG and E. KÄPERNICH. *Metallwirtschaft* **17,** 665-8 (1938); *Chemical Abstracts* **32,** 8946 (1938). When aluminum alloys are anodized, chromium, manganese, iron, copper, vanadium, nickel as alloying elements become oxidized and may precipitate in the oxide film causing it to become dark. Coarse precipitated silicon enters the film unchanged. The alloying elements do not essentially influence the thickness of the anodized film. ERNEST H. LYONS, JR.

Electrodeposition of Indium and Silver-Indium Alloys. By E. RAUB. *Mitt. Forsch. Inst. Probieramts Edelmetalle staatl. höheren Fachschule schwäb Gmünd* **12,** 55-9 (1938). Plating with indium and silver-indium does not produce tarnish-proof layers; the deposits from cyanide, cyanide-free, chloride and sulfate solutions are sometimes dull; polishing removes too much metal, as indium is very soft. A superficial silver-indium alloy was obtained by diffusion in hydrogen on indium-coated silver sheets; this layer was hard and also tarnish-proof but was dull even in the polished condition so that it cannot be used for practical application. M. HARTENHEIM. *Chemical Abstracts* **32,** 8947 (1938).

Aluminum-Coated Steel Wire. By COLIN G. FINK. *Wire and Wire Products* **1938,** 578-81. Wire is coated with aluminum by a hot-dip method after "prepacking" the steel with hydrogen. The product is soft, ductile, and resistent to corrosion. ERNEST H. LYONS, JR.

Activated Carbon in Electroplating Solutions. By W. A. HELBIG. *Metal Industry* Vol. **36,** December, 1938. Filtration with the aid of activated carbon as a medium for the removal of excessive suspended matter such as, lubricating oil, organic matter from rubber tank linings, degraded products of the brightening and anti-pitting agents and other collodial impurities in bright nickel plating solutions are interpreted by the author. Instructive procedure and a mathematical formula for the packing of the filter with activated carbon are giving, along with the rate of circulation through the filter.

The specifications of the activated carbon, should be as follows:—free of objectionable soluble matter as iron, sulphides and alkalies, it should not be ground to excessive fineness. A carbon suitable for electroplating solutions should have an apparent density of 0.40 to 0.45 equivalent to 25-28 lbs. per cubic foot. PAUL A. OLDAM.

PLATING ON ALUMINUM

Mr. George Wagstaff,
Acme Shear Co., member of Bridgeport Branch

Aluminum is higher than zinc in electromotive series and because Aluminum forms an oxide very readily on exposure to air it makes it rather difficult to electroplate.

The most important thing I wish to mention is the composition of the aluminum to be plated. The alloys I would recommend are 88% to 92% Aluminum, 5 to 8% Silicon, 5 to 6% copper. An alloy containing Magnesium can not be used with this method, and I think that is the reason why so many platers have had trouble with their experiments in plating of aluminum. (Doe metal 95% Magnesium.)

This finish has had tests of more than forty hours Salts Spray before any signs of breakdowns. Care should be taken in preparing the surface for plating, as to polishing, buffing and keeping the dips up to the proper concentration. The burning of the surface during the polishing and buffing operation, should be avoided and the proper wheels, speed, and buffing composition used. As every polisher and buffer differs as to the grain of emery and composition used, I am only stating the experiences I have had and the compositions of wheels and emery I have used.

I have plated Sheet Aluminum, die cast, and sand cast aluminum of the above mentioned alloys, with equal results, and can say that with the proper cautions the rejects will be very small.

Polishing and Buffing

Die Cast Aluminum.

Polish the burrs, fins and uneven surface first with 120 grease wheel. Do not use a dry wheel on any operation.

Smooth over with 180 artificial abrasive or 150 turkish emery well greased.

Finish polishing on 220 artificial abrasive or 180 to 200 turkish emery or Lea Compound.

Sand Cast Aluminum.

Rough out with 100 Grease wheel.

Smooth over with 120 artificial or turkish emery grease wheel.

Finish polishing 200 to 220 grease wheel.

Sheet or struck up Aluminum.

Finish only on 220 grease wheel or Lea Compound or both.

Never use a newly set up wheel without first breaking in the surface.

The types of wheels to be used will depend on the shape of the article to be finished.

Buffing.

Cut down with tripoli or white diamond on loose buffs at speeds from 2300 to 2800 R.P.M. on 8" to 10" wheel. Sewed wheels and high speed will cause burning.

Degrease or Solvent

Color with white diamond or lime compound not too moist.

Plating

Rack the same as steel or brass to within 6" from bottom of tank.

Immerse in mild cleaner of about 2½ to 3 oz. per gallon, for about 1 to 2 minutes. Strike on current of 2 to 4 volts.

Water rinse (spray).

Dip 3% Sodium Cyanide Solution.

Barrel Finishing of Metal Products. H. LEROY BEAVER. "*Product Finishing*", Jan. 1939, pp. 28-34. Finishing zinc and aluminum die castings in barrel. Barrel finishing of die castings should be more widely used than it is. Consists of a cutting down operation prior to plating, a burnishing operation to smoothen the surface, copper plating, burnishing, final plating and final burnish for luster. Oxide coating forms on zinc after barrel operations. Two schools of thought; one holding that die casting must be roughened up for adhesion, the other holding that surface should be smooth.

Heavy fins should be ground off on wheel, as a barrel operation will roll over a fin on a soft non-ferrous metal like zinc. Dry grounding is done in a wood lined barrel, with maple sawdust or corn cob meal, about 4 to 1, with ordinary pumice. This gives matte finish in about 4 hours. Maximum speed about 30 R.P.M. Parts should not "throw" or parts will dent, being soft. Other operations such as copper, nickel, etc., are done in conventional manner.

In barrel finishing aluminum, similar procedure should be used, except that barrel should be loaded nearly full, or light aluminum parts will float. Soaps recommended are mild vegetable base soda soap of low titer, and nearly neutral. A soda ash cleaner and 5% HF acid dip recommended for cleaning.

PHIL J. RITZENTHALER.

Cleaning Solutions. *The Metal Industry*, London, England. Volume **LIV**, No. 3. January 20, 1939. Among recent developments for maintaining clean solutions in electroplating is a continuous filter which accomplishes this purpose without interfering with operations according to "Monel Notes—14", recently issued.

Built on an entirely new principle, the filtering element consists of two Monel cylindrical screens, one inside the other, the inner screen being covered with two layers of a special cloth. This cloth can be removed for cleaning or replacement in four minutes. Solution is withdrawn from one end of the plating tank, filtered and returned to the opposite end, thus keeping the entire solution in constant circulation and dislodging and removing sediment. Efficiency is limited only by the capacity of the filter cloth, and when that capacity is reached the pump is automatically stopped.

These particular filters have been found highly satisfactory with nickel, cyanide copper, cadmium, silver, and other solutions. With slight changes in constructional details they can be adapted to bright nickel solutions.

ROBERT B. GOODSELL.

Corrosion Protection of Aluminum by Anodic Oxidation. By A. GLAZUNOV. *Chem. Listy* **32,** 317-20 (1938). **Anodic Oxidation of Aluminum and its Alloys.** By J. DONALDSON CRAIG. *J. Roy Aeronaut Soc.* **42,** 603-12. See *Chemical Abstracts* **32,** 8946 (1938). General reviews and description with details of anodizing processes and results obtained.

ERNEST H. LYONS, JR.

Water rinse (spray).

Dip 2% Hydrofluoric until work gases.

Water rinse (spray).

Dip from 15 to 20 seconds in solution of the following:

1 part Sulfuric; 1 part Nitric; 1 part Water.

When strengthening dip, use more nitric than sulphuric and no water.

Quick water rinse (spray).

Zinc dip of the following for 20 to 30 seconds:
1¼ lbs. Zinc Sulphate; 1½ lbs. Sodium Hydroxide; 1 gal. Water. temperature 100°F. to 120°F.

Quick water rinse (spray).

Nickel plate in solution for zinc 45 minutes at 5 to 6 amps. per sq. ft.

Rinse.

Dry in sawdust and air.

Color with lime nickel compound.

Chrome plate as you would other buffed nickel pieces.

The Cycles and strengths of the dips mentioned can be varied to some extent without much change in the work to be plated.

Resolution

MILWAUKEE, WIS.
February 2, 1939.

To All Branch Secretaries and Members:

The members of Milwaukee Branch of the A.E.S. wish to submit for your careful consideration the following resolution, which is to be acted upon at the forthcoming Newark convention.

To wit:

> "Be it resolved that in the future local branches of the A.E.S. will be restrained from soliciting or using paid advertising in support of local functions, such as dinners, banquets, smokers, etc. Paid advertising is to be used only for the National Conventions."

We, members of Milwaukee Branch, have, from experience in soliciting funds for the Annual Convention in 1938, found that most of the branches solicit funds from the Plating Supply Houses for local banquets, smokers, picnics, etc. Therefore, when our treasurer solicits for the Annual Convention he is confronted with the problem of supply dealers not being any too anxious to contribute on account of having done so throughout the year. As these local affairs are too localized for the many suppliers to gain worthwhile benefit from the money expended, it is suggested that this practice be done away with.

Sincerely,

DAN WITTIG
ROBERT STEUERNAGEL
A. J. HERMANSEN,
Chairman.

Danger of Arsine Poisoning in the Electroplating Industry. *Mitt. Forschungsinst. u. Probieramts für Edelmetalle,* **12,** Nr. 7/8, Oct./Nov. 1938, p. 79. Arsine (AsH_3) is a colorless gas of unpleasant odor and exceptional toxicity. It is a nerve and blood poison, and especially dangerous since the symptoms (headache, vomiting, stomachache, later jaundice, nose-bleed and difficulty in breathing) appear after intervals of hours and even days and help is then too late. As little as .02 mg. in a liter of air, inhaled for a half hour, can endanger life.

Arsine is produced from arsenic compounds and nascent hydrogen in acid solutions. Such conditions may arise in the pickling of steel unless very pure acids are used, in certain black nickel baths (containing arsenic trioxide), in baths for coating with arsenic by dipping in hot solutions of the trioxide in hydrochloric acid and ferric chloride (especially when metallic zinc is also used), and in stripping faulty nickel deposits anodically using 53° Be′ sulfuric acid, when arsenic has been added to decrease attack of the basis metal.

Unless arsenic-free solutions are substituted for the above, particular care should be paid to proper ventilation, and in more severe cases, to air-suction equipment. N. E. PROMISEL.

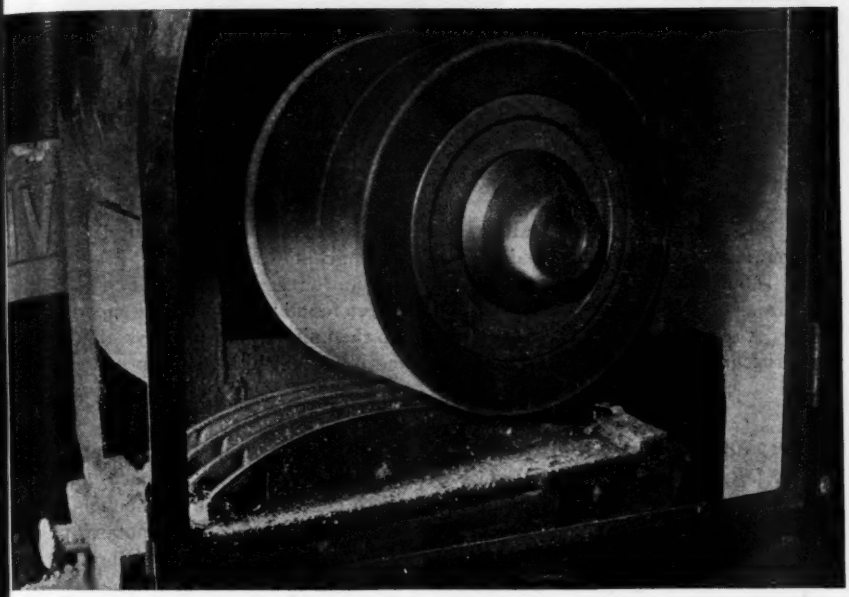
Electroplating. Testing of Copper-Nickel Plate. By R. LIEBETANZ. *Metallwären-Ind. Galvano-Tech.* **36,** 327-9 (1938). The plate from a sheet of copper-nickel plated steel is dissolved in 20% potassium nitrite acidified with acetic acid. To determine the percentage composition of copper and nickel, the solution is evaporated to fumes with sulfuric and nitric acids. The copper is plated out from the acid solution using platinum electrodes at 3 v. and 3-4 amps., and weighed. The nickel may be determined by making the remaining solution ammoniacal and titrating with potassium cyanide containing a trace of silver nitrate. For more accurate results, the ammoniacal solution may be electrolyzed and the deposited nickel weighed, or it may be precipitated with dimethylglyoxime. The plated sheet is weighed before and after dissolving the plate to determine the weight of material dissolved. The iron in the solution is determined and subtracted from the weight difference to get the weight of copper and nickel dissolved. By dividing the weights of copper and nickel each by the total weight of copper and nickel dissolved, the percentage of each present in the plate is determined. L. H. SEABRIGHT.

Chemical Abstracts **32,** 8950 (1938).

Electrodeposition of Lead on Base Metals. I. Behavior of Alkaline Baths with Iron Cathodes at Low Current Densities. By SHRIDHAR SARVOTTAM JOSHI and T. V. SUBBA RAO. *J. Indian Chem. Soc.* **15,** 377-82 (1938). The electrodeposition of lead from solutions of PbO in aqueous alkali (9.38 g. PbO and 43.5 g. NaOH per l.) was investigated. The effects of current density (0.93 to 6.2 amp./sq. ft.), temperature (68° to 162° F.), addition agents and salts (gelatin, antimony and thallium salts), and an intermediate coating of metallic antimony were studied. The quality of the deposit improves with increasing current density (at constant temperature) until approximately 3.0 amps./sq.ft. The deposit was further improved by the addition of gelatin, Tl_2CO_3, and a preliminary deposit of antimony.

W. GEORGE PARKS.

Chemical Abstracts **33,** 486 (1939).



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NORTON ABRASIVES

Tellurium Lead for Plating and Pickling Equipment. By G. O. HIERS and G. A. STEERS. *Metal Industry*, Vol. **36,** pages 563-566. December, 1938. Tellurium lead has been used with increasing frequency for linings, heating coils, anodes, and other purposes in plating and pickling equipment to a good advantage. An addition of less than 0.1% of tellurium to regular chemical lead provides special properties, e.g.: Improved resistance to hot sulphuric acid is reported to be approximately 25 per cent longer with tellurium lead as compared to other leads used as a lining for pickling tanks.

Tellurium lead anodes in a chromium solution containing 32 ounces of chromic acid per gallon at 135 deg. F. have been found beneficial. The superiority of tellurium lead is claimed to be due to the uniform and fine crystal grain structure, that affords better fatigue strength and chemical resistance.

PAUL A. OLDAM.

Conductometric Methods for Analytical Determination of Metals. By DR. J. GRANT. *Metal Industry*, Vol. **37,** pages 21 to 23. January, 1939. Descriptive information is given in regard to conductometric methods as to its application in the analytical determination of silver, zinc, lead, potassium, calcium, barium and magnesium. The phenomenal aspects of the method are defined. The equipment and essentials involved in the use of the method, along with the outlined procedure are mentioned. It is stated that clear and sharp end points are obtained. The method also warrants its application for the determination of organic substances. PAUL A. OLDAM.

Depositing Uniform Thicknesses of Metal for Plating to Specifications. By JOSEPH HAAS. *Metal Industry*, Vol. **37,** pages 24 to 26. January 1939. The author in the concluding installment of his writing summarizes the necessary requirements for continuous efficient productive plating as would be essential to given specifications. Some of the requirements mentioned are:— Tanks, circular or horizontal conveyor type. Anodes, elliptical, fishbone or ball, bagged to prevent metal particles from floating through solution. Depth of anodes and cathodes should be equal. Racks to be conductive and sufficient capacity to carry the current without heating and to be mechanically perfect. The solution should be made with a salt that will give a high metal concentration but low metal ionization, with a buffering agent to protect the solution from wide fluctuation in pH. The degree of temperature should be determined in conjunction with the distance between anode and cathode and current density used. PAUL A. OLDAM

Development of Industrial Spray Booths. By CARLETON CLEVELAND. *Metal Industry.* Feb. 1939. The author describes past and present designs of spray booths. The old type spray booths were inefficient due largely to accumulation of paint on fan parts. Modern booths are now equipped with deflectors or baffle plates across entire back of the booth. Plates equalize velocity of air eliminating dead air pockets, also prevent paint from accumulating on fan blades. Principles of the dynaprecipitor and water-wash spray booths are also illustrated and explained. EDMUND S. JEVELI.

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Nickel Plating of White Alloys. By A. DARLAY. *Galvano* (Paris). Oct. and Nov., 1938. Alloys of high zinc content are difficult to plate adherently, and tend to contaminate both cleaning and plating baths by solution of zinc. The use of a degreasing-coppering bath at high current for one minute is preferred to the use of the electrolytic alkali cleaner followed by acid rinse that is used in America. Use of cyanide copper or brass in heavier deposits before nickel plating is not considered good practice.

Use of a nickel striking bath at 35° C. (95° F.) and pH 6 to 6.5, with current density of 60 to 75 amperes per sq.ft. for one or two minutes is recommended. The composition of this bath is given as:

Nickel Sulphate	—	100 g/l. or	13.4 oz/gal.
Sodium Sulphate	—	70 g/l. or	9.4 oz/gal.
Ammonium Chloride	—	15 g/l. or	2.0 oz/gal.
Boric Acid	—	15 g/l. or	2.0 oz/gal.

An operating bath formula is also given as:

Nickel Sulfate	— 160 g/l. or
Sodium Sulfate	— 110 g/l. or
Magnesium Sulfate	— 5 g/l. or
Ammonium Chloride	— 12 g/l. or
Boric Acid	— 15 g/l.or

Temp. 35° C. (95° F.), pH 6 to 6.5.

C. T. THOMAS.

A New Method of Polishing and Buffing Semi-Automatically. By B. F. BOWER. *Metal Industry*, Vol. **37,** No. 2, Feb., 1939. A rapid method of polishing metals in which loose abrasive is applied to a hard muslin wheel rotating at a surface speed of from 1200-1500 ft. per minute. Pressure applied to wheel is about 200 lbs. per sq. inch. A combination polishing and buffing action is obtained. EDMUND S. JEVELI.

Quality and Quantity in Metal Finishing. By GEORGE SIMMONS. *Metal Industry*, Vol. **37,** No. 2, Feb., 1939. The importance of proper design, careful handling and purchasing of materials before plating is discussed. The success of the finishing department depends a great deal on the co-operation it receives from the engineering and press dept. The author stresses the advisability of consulting the finishing department supervisor on plant operations and design. EDMUND S. JEVELI.

Production of Name Plates and Metal Stampings. By FRANK FOX. *Metal Industry*, Vol. **37,** No. 2. Feb., 1939. The author describes manufacturing methods for the production of nameplates, escutcheons and decorative metal parts. Press operations, enameling and plating methods are outlined. The article is well illustrated. EDMUND S. JEVELI.

Heavy Chromium Plating to a Given Thickness. By E. F. INGERSOLL. *Product Finishing*. Feb. 1937, pp. 26-36. Excellent discussion of hard chrome plating on plastic molding dies, cams, shafts, drills, cutting tools,

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etc. Other applications are reamers, punches, stamps, gages, sleeves, gears, cutters, slotters, thread rollers, dies, undersize parts. Author claims lack of more general use due to reluctance to try out chrome finish. Also to poor workmanship by unskilled platers. Claims 90% of success due to plater.

Chrome being extremely hard needs very hard base metal. Recommends hardening steel to be plated. Coefficients of expansion of chrome and steel should be considered, as many tools operate hot. Chrome plating prevents plastics from sticking to molding dies. From half to two ten thousands is recommended. Increases life on drills for soft abrasive materials like bakelite from 5-10 times. Good for cutting tools for easy chip removal.

Work to have one thousandths thickness should be finished undersized to allow for plating, plated about a half thousandth over and then stoned down to size.

Describes racking, cleaning and stopping off. Stripping should be done in caustic solutions of about 15 oz/gal., at 50 amps/sq. ft.

PHIL J. RITZENTHALER.

Methods Used in Silverware Manufacture. By FRED VOGEL. *Product Finishing*, Jan. 1939, pp. 7-15. Describes production in International Silver Company. Good discussion on automatic polishing equipment needed on silver flatware. Silver strike, high in copper used preliminary to silver plating. Agitation (mechanical) is used at cathode; anodes are shielded with cotton baffle filter screens. Accurate check is made of weight of silver plated, to control thickness of plating. Full automatic silver plating machine is used. Unique process is application of heavier coating on bottom of bowl of spoon. Pieces suspended over tank, with tubes squirting solution on bottom of spoon only. Thus only area in contact with solutions will plate.

PHIL J. RITZENTHALER.

Review of the Latest Product Finish Materials. *Industrial Finishing*, January 1939. pp. 38. General discussion of the results of technical developments in protective and decorative finishes. Most interesting example given is development of the urea-formaldehyde synthetic resin as a protective film. Curing time to produce porcelain like film as low as five or six minutes at 325° to 350°F. giving a mar proof, chip proof, moisture resistant film. Improvements in vinyl-resin, acrylin-acid-resin, lacquer, wrinkle, and new color finishes are cited.

The review describes thirty two bake finishes, ten air dry or bake finishes, eighteen air dry finishes, thirty eight wood finishes, nine rubber, paper, and fabric finishes, and twelve miscellaneous items which have been improved upon in the past year. The particular virtues, uses, and characteristics of each product is elaborated upon to some length. A very complete picture of the present available types of non metallic protective films.

FRANK K. SAVAGE.

Metallurgical Applications of Electron Diffraction. By H. R. NELSON, Batelle Memorial Institute, Columbus, Ohio. *J. Applied Physics*, Vol. 9, No. 10, Oct. 1938. The similarity between electron and X-ray diffraction

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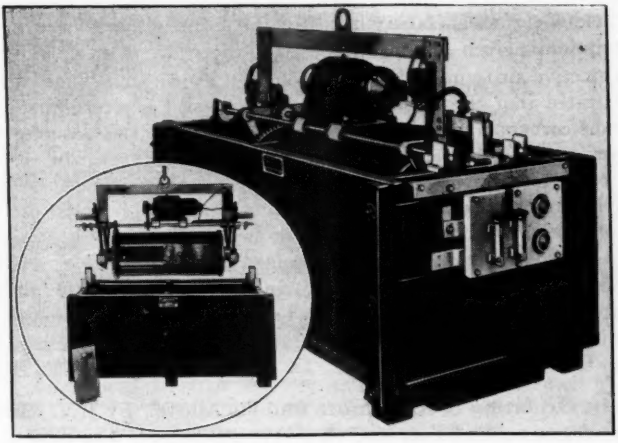

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suggested the possible usefulness of the former for the study of crystalline solids. X-ray and electron diffraction effects involve interaction of trains of waves in the regular array of atoms of a crystal lattice; the same diffraction laws apply to both and the diffraction patterns are interpreted in the same manner. There is, however, the very important difference that X-rays penetrate very deeply into solids whereas electrons are ordinarily stopped by thicknesses of a few millionths of an inch, hence the value of the latter in the broad field of surface chemistry including the nature of films formed on metal. A description is given of apparatus used in the study of electron diffraction. The protective air-formed film on aluminum is shown to be amorphous. It is demonstrated that the crystals of an electrodeposit of iron are standing on their cube corners, and that a thin film of rust on the electrodeposit is made up of crystals of random orientation whereas those formed by oxidation in air at room temperature are shown to be oriented with reference to the underlying iron crystals. When one metal is deposited upon another, the first few atoms tend to arrange themselves in accordance with the crystal lattice of the basic material. Evidence is obtained of the presence of a highly disorganized layer at the surface of polished or buffed metals. Limitations of the methods are discussed and the conclusion reached that although it is not yet an instrument for routine analysis, it is already a valuable metallurgical research tool. JOHN T. ROONEY.

Anodic Oxidation of Aluminum and Its Alloys. By J. V. RUSHTON. *J. Electrodepositors Tech. Soc.* Vol. **14,** p. 191-203 (1938). The chief anodizing processes are (1) the Bengough-Stewart which uses a 3% CrO_3 solution. The operating conditions are:—Temperature 40°C. (104°F.), current density 4 amp./ft.^{2}, the anodizing requires an hour, during which time the voltage is gradually raised to 50 volts. (2) The H_2SO_4 process uses a solution containing 1-25% of the acid. The operating conditions depend on what strength electrolyte is used. Voltages range from 6 to 20 volts; current densities from 1 to 40 amp./ft.^{2}; temperatures from 15 to 22°C. (60-70°F.). (3) The oxalic acid process produces the hardest films but it is not much used. Process (1) produces an opaque grey film; (2) produces a silvery film; and (3) a yellow film. The films on aluminum alloys vary in color. Articles for anodizing must be degreased. Anodizing racks are of aluminum, and care must be exercised in making contact with articles, as the contact may become insulated by film formation and arcing and burning will result when the voltage is raised. Some of the difficulties encountered in anodizing and the method of overcoming them are discussed. These include anodizing porous castings and welded objects, burning, gas traps, pitting, etc. Many difficulties can be prevented by the proper design of the articles. The thickest films are obtained by the H_2SO_4 process, and may be 0.008 in. thick. The production of anodic films for dyeing requires especial attention to the cleaning of the object, if uniform coloring is to be obtained. It is difficult to match the color of different sheets. A. BRENNER.

Electrodepositors and the Patent Law. By. G. S. W. MARLOW. *J. Electrodepositors Tech. Soc.*, Vol. **14,** p. 183-190 (1938). A discussion of English patent law. A. BRENNER.

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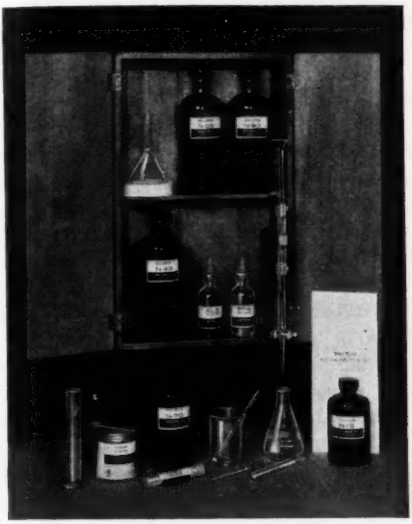

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Electrodeposition of Tin from Alkaline Solutions. By S. BAIER and R. M. ANGLES. *J. Electrodepositors Tech. Soc.*, Vol. **15,** p. 1-30, (1939). Publications of the International Tin Research and Development Council, No. **82.** A typical stannite bath is $SnCl_2.2H_2O$, 1.7 oz./gal.; KOH, 6.7 oz./gal.; glue 0.067 oz./gal.; temperature, 140-195°F.; current density, 5 amp./ft.2. If the Sn^{II} content falls below 0.75 oz./gal. the deposits are spongy; if it is about 2 oz./gal., the deposit is crystalline and discontinuous, and the basis metal is not completely covered. Even the best deposits are more porous than those from the stannate bath. The current efficiency as Sn^{II} is over 95%. The bath oxidizes on standing, but the stannate formed does no harm. Stannate Bath—Good deposits can be obtained from the stannate bath over a wide range of tin concentration (0.4-12.0 oz./gal.) and operating conditions; but a cathode current efficiency of 90% (as Sn^{IV}) is obtained only under certain conditions. A typical bath is 6.0 oz./gal. of tin, 1.7 oz./gal. of free NaOH; temperature, 170°F.; current density, 15 amp./ft.2. The current efficiency of a stannate bath is increased by lowering the current density, increasing the tin content, and raising the temperature. Increase in free NaOH decreases cathode efficiency. The free NaOH in a bath should be about 1/3 the weight of the tin. The NaOH gradually absorbs CO_2, and the resulting Na_2CO_3 lowers the acthode efficiency. At low current densities tin dissolves anodically as Sn^{II}, at high current densities it dissolves as SN^{IV} and a film forms over the anode. Thesolution of the anode as Sn^{II} must be avoided, because as little as 0.03 oz./gal. of tin as stannite will produce spongy deposits in a stannate bath. If a film is formed on the anode by a high current density the anode will continue to dissolve as Sn^{IV} at low current densities, with 80-100% efficiency. However, if the current density falls below 0.5 amp./ft.2, the film disintegrates and the anode dissolves as Sn^{II}. The critical current density required to first form the film varies from 40 to 100 amp./ft. at 70-80°C. It increases with temperature, and concentration of free NaOH and stannate, but it is decreased by addition of Na_2CO_3. The stannate bath may be satisfactorily operated with insoluble anodes of Ni or Fe. The stannate-acetate bath which contains Na acetate has been used in large installations. Its behavior is identical with the plain stannate bath. Addition agents, such as lactic acid, rosin, starch, etc., are sometimes added to the stannate bath to give smoother deposits. These substances, however, reduce the cathode efficiency as much as 20%. The analytical control of the plating baths is given. The harmful impurities in commercial Na stannate are $NaNO_3$ and Sb. A. BRENNER.

Engineering Uses of Heavy Metal Deposits. By FRED P. PETERS. *Metals and Alloys*, Volume **10,** No. 2. February, 1939, pages 42, 47. Describes the engineering uses of heavy nickel deposits and other plating advances, and lists plating baths producing both hard and soft nickel; compares electrolytic deposits with other forms of the metal.

Applications given for electro-forming and building up of engineering equipment; also production of pore-free nickel deposits. This article was primarily written for metallurgical engineers.

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The Electrodeposition of Tin from Acid Sulphate Solutions. II. By A. W. HOTHERSALL and W. N. BRADSHAW (Research Dept., Woolwich). *J. Electrodepositors Tech. Soc.*, Vol. **15**, pp. 31-48, (1939). Publications of the International Tin Research and Development Council, No. **83.** Three different types of addition agents are required in an acid tin bath:—(1) cresol sulphonic acid to retard oxidation of the Sn^{II} to Sn^{IV}; (2) a protective colloid, such as gelatin or lysalbic acid; and (3) a hydroxy compound, such as B-naphthol. The authors investigated the effect of three different combinations of addition agents on the deposit obtained from the following bath: 4.0 oz./gal. of Sn as $SnSO_4$; 8.0 oz./gal. of H_2SO_4; and 13.5 oz./gal. of cresol sulphonic acid. Combination (I): 0.3 oz./gal. of gelatin and 0.13 oz./gal of B-naphthol. (II): lysalbic acid, 0.13 oz./gal. and B-naphthol, 0.13 oz./gal. (III): lysalbic acid, 0.13 oz./gal. and resorcinol 2.7 oz./gal. The baths were compared with respect to covering power, which is the minimum cathode current density that will give a continuous deposit 0.00005 in. thick on a Cu cathode. Bath III had the poorest covering power, which was more than 10 amp./ft^2.. Bath I and II had a covering power of about 1 amp./ft.^{3}, but over a period of 6 months bath II was the more stable. Deposits 0.0001 in. thick were very porous. Non-porous deposits 0.0005 in. thick were obtained from baths I and II at 5-15 amp./ft.^{2}; bath III gave porous deposits at 5 amp./ft^2. and non-porous deposits at 10-15 amp./ft^2. The deposits obtained from Bath I at current densities above 20 amp/ft^2 were very porous, even if they were 0.001 in. thick. Cathode agitation considerably reduced the porosity of coatings formed at these higher current densities. The porosity of coatings, after being bent around a 1/32 in. radius, was determined. The smallest increase in porosity was shown by coatings 0.0005-0.001 in. thick, plated out of baths I and II at 5-10 amp./ft.^{2} and out of III at 10 amp./ft.^{3}. All three baths showed good stability. After being in operation 6 months, there was little change in the Sn^{II} conc. or increase in the Sn^{IV} conc. The cresol sylphonic acid, which is added to retard oxidation of Sn^{II}, also improves the covering power of the bath. Other benzene and phenol sulphonic acids were less effective than cresol sulphonic acid in improving covering power, but were about equally effective in retarding oxidation of Sn^{II}. Various organic hydroxy compounds were tested as substitutes for B-naphthol, which is added to the bath to produce smoother deposits. p-isoamyl phenol gave comparable results. Other compounds had the disadvantage that they decreased the covering power. No satisfactory substitutes for gelatin or lysalbic acid were found. Details of the preparation and analysis of the bath are given.

A. BRENNER.

Protection of Magnesium Against Corrosion. By J. FRASCH. *Metaux et Corrosion*" (French), Vol. **13**, May, 1938, pp. 91-94. Magnesium in air becomes covered with Mg hydrate which changes to carbonate. Copper plating is porous and does not protect. Similar to Al, oxidation offers protection. Chemical methods use chromates, titanates, manganates, molybdates. Best electrolytic method recommended uses 1% NaOH solution, making article the anode at 10:20 volts and 4-6 amps./SF. Sodium silicate additions produce more inert film.

PHIL. J. RITZENTHALER.